Santa Clara Valley Water District Commercial, Institutional and Industrial (CII) Water Use and Conservation Baseline Study

Final Report

April 2005

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by

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Executive Summary

ES.1 Introduction to the District

The Santa Clara Valley Water District (District) is the wholesale supplier of water in California's Santa Clara County, the boundaries of which coincide exactly with the District's 1,300 square-mile service area. The District provides water to 1.7 million people via its service to 13 water retailers throughout its jurisdiction, including to the San Jose Water Company, which accounts for about half of the total water use in the District. The other major water retailers served by District include the California Water Services Company, the Gilroy Community Services Department, the Purissima Hills Water District, the City of Milpitas Community Services, the City of Morgan Hill Public Works Department, the City of Mountain View Public Services Department, the City of Palo Alto Utilities Department, the Great Oaks Water Company, the San Jose Municipal Water System, the City of Santa Clara Water Department and the City of Sunnyvale Public Works Department.

ES.2 Purpose of Study

The District sought to better understand the water-using characteristics of commercial, institutional, and industrial establishments for the purpose of gaining information to more effectively target its water efficiency program efforts. Through the Baseline Study, the District specifically sought to: (1) determine the prevalent types of water-using fixtures and appliances, and (2) characterize water-using behaviors of selected nonresidential customer groups. The insight obtained by the Baseline Study would be used by the District to design cost-effective long-term water efficiency programs and to have a baseline from which to evaluate the potential impacts of water efficiency measures. Furthermore, the study results will be useful for service area demand forecasting, conservation program marketing and design, and best management practice (BMP) program implementation, and BMP program evaluation.

In cooperation with the District, the focus of the Baseline Study was refined to target selected commercial, institutional, and industrial establishments (referred to as CII customers). It was deemed that the District could determine from its water retailers *how much water* was being used by selected customer groups. However, this would not provide adequate knowledge about *how customers are currently using water*. In order to meet the District objectives, the Baseline Study sought to collect information about targeted CII customers groups (or subsectors) through on-site surveys of a sample of CII establishments.

Based upon preliminary analyses of the types of business establishments in the District, their likely contributions to overall CII water use in the District, and their potential for participating in water efficiency program initiatives, the District chose to target the 11 subsectors shown in Table ES-1. Two-hundred and twenty-five on-site surveys of establishments in the designated CII subsectors were completed between January and June 2004.

Table ES-2 highlights the various types of information that were targeted for data collection through on-site surveys of selected establishments.

TABLE ES-1 SURVEYED SUBSECTORS		
Target Subsectors	**Estimated Number of Establishments in Santa Clara County**	**Number of Surveys Completed**
Office Buildings	Unknown	26
Semiconductor & Other Electronic Component Manufacturers	479	28
Offices of Physicians and Dentists	2,365	22
Fabricated Metal Product Manufacturers	716	21
General Medical & Surgical Hospitals	13	5
Food Product Manufacturers	156	22
Hotels/Motels	226	22
Grocery Stores	335	22
Nursing Care Facilities	64	15
Wholesale Grocery & Related Product Facilities	190	20
Elementary & Secondary Schools	109	22
TOTAL	**4,653**	**225**

TABLE ES-2 SURVEY MEASUREMENTS	
General Site Characteristics ▪ Age of building structure ▪ Building(s) square footage ▪ Employment ▪ Subsector-specific data (number of students, number of beds, number of patients)	General Conservation Perceptions ▪ Potential conservation program participation ▪ Ratings of alternative conservation programs ▪ Ratings on conservation incentives ▪ Ratings on conservation information sources
Water Source Inquiries ▪ Type of water sources ▪ Reasons for recycled water use ▪ Reasons for no recycled water use	Water Use Types/Fixture Counts ▪ Sanitary ▪ Facility cooling/heating ▪ Laundry ▪ Kitchen ▪ Special purpose uses ▪ Landscape
Appliance/Fixture Testing ▪ Toilets ▪ Urinals ▪ Faucets ▪ Showers ▪ Dishwashers ▪ Clothes washers ▪ Garbage disposals ▪ Pools/spas	Outdoor Characteristics ▪ Lot size, hardscape, landscape, turf areas ▪ Irrigation systems ▪ Controller data ▪ Outdoor pools, spas ▪ Fountains ▪ Distribution system uniformity and precipitation rate

ES.3 Study Findings

The following subsections provide highlights from the data analysis of the results from the on-site surveys.

ES.3.1 Types of Water Uses

One of the primary objectives of the Baseline Study and a primary focus of the on-site surveys was to determine *how customers are using water*. How customers use water can be defined by the types of water-using fixtures and appliances that exists in given establishments (these are considered *end uses* of water). Table ES-3 provides an overview of the types of water uses and the percentages of facilities with that reported type of use. Table ES-4 provides the percentages of facilities with specific types of water-using fixtures and appliances (these only represent selected, not all, characteristics that were measured in the surveys). As would be expected, the existence of specific water uses is often a function of the services offered or goods produced by establishments in the subsectors. Knowledge about end uses of water will allow the District to more effectively target conservation programs to particular end uses and make more accurate estimates of potential water savings.

As part of the on-site surveys, the field team also took measurements of flush and flow rates of various types of fixtures; these measurements are summarized in Table ES-5. The flush/flow rates provide indications of where there may be opportunities for increases in water use efficiency in selected fixtures.

TABLE ES-3
PERCENTAGE OF FACILITIES WITH REPORTED TYPE OF WATER USE

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Domestic/ sanitary	100	100	100	100	100	100	100	100	100	100	100	100
Facility cooling & heating	96	86	45	71	80	100	95	82	100	70	95	84
Once-through cooling	81	46	27	52	40	36	55	55	47	25	50	48
Laundry	0	0	18	5	80	27	86	5	100	0	14	24
Kitchen	88	79	82	62	100	77	91	77	93	65	95	81
Ice-making	8	18	9	0	100	32	95	77	100	35	27	39
Washing & sanitation	35	50	68	67	60	68	32	64	100	70	86	62
Maintenance shops	15	32	9	19	20	23	27	0	40	10	14	19
Laboratories	8	46	59	19	60	18	0	0	7	0	18	20
Process water for product mfg.	4	71	0	81	0	77	0	0	0	45	0	28
Water purification	15	71	32	38	100	55	64	41	80	20	5	43
Wastewater pretreatment	4	7	5	14	0	23	0	0	0	10	0	9
Miscellaneous use	8	21	50	0	60	9	5	14	47	0	0	14
Landscape use	81	68	50	24	100	36	100	32	100	30	95	62
Other water features (pools, spas, fountains)	8	0	0	0	40	0	82	0	20	0	36	15

TABLE ES-4
PERCENTAGE OF FACILITIES WITH REPORTED TYPES OF SELECTED FIXTURES AND APPLIANCES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Toilets	100	100	100	100	100	100	100	100	100	100	100	100
Urinals	96	93	32	71	60	54	73	73	100	65	95	69
Showers	38	39	9	33	100	9	100	5	0	10	27	37
Cooling towers	31	36	18	10	60	27	36	41	0	10	0	23
Commercial washing machines	0	0	14	0	40	14	82	0	100	0	5	19
Self-service washing machines	0	0	0	0	40	14	59	5	27	0	9	11
Dishwashing machines	42	21	18	10	100	27	86	0	87	10	68	37
Pre-rinse sprayers	4	0	5	5	60	23	64	55	60	10	50	27
Garbage disposals	58	36	18	10	80	14	45	5	87	10	9	33
Ice-making machines	8	18	9	0	100	32	95	77	100	35	27	39
Swimming pools	0	0	0	0	0	0	77	0	0	0	23	10
Jacuzzis/spas	0	0	0	0	20	0	73	0	7	0	0	8
Fountains (decorative)	0	0	0	0	20	0	18	0	13	0	9	5

TABLE ES-5
MEASURED FIXTURE FLUSH/FLOW RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Gravity-flush toilets (gpf)	3.24	2.36	3.45	2.84	2.78	3.65	2.49	4.11	3.21	3.58	2.89	2.91
Pressure-assisted toilets (gpf)	1.73	1.60*	1.60*	1.60	NA	2.48	1.50*	1.60	1.60*	3.53	1.75	1.84
Other toilets (gpf)	2.67	2.99	1.93	2.77	1.50*	6.00*	2.65	2.00	4.01	1.60	2.45	2.57
All measured toilets (gpf)	2.53	2.43	2.66	2.74	2.64	3.52	2.50	2.43	3.27	3.31	2.32	2.67
Urinals (gpf)	1.38	1.42	1.25	1.08	1.00*	1.58	1.09	1.35	1.00*	1.73	1.57	1.40
Restroom faucets (gpm)	2.27	2.31	2.89	3.24	2.46	2.28	2.15	2.20	2.43	2.65	1.93	2.38
Kitchen faucets (gpm)	2.34	2.46	2.16	2.17	6.23	3.71	3.23	4.35	3.51	2.52	2.45	3.12
Utility faucets (gpm)	1.75*	2.95*	6.00*	4.20	NA	4.00*	NA	4.90*	3.39	1.95*	3.00*	3.63
All measured faucets (gpm)	2.27	2.33	3.06	3.19	3.09	2.70	2.28	2.94	2.68	2.59	2.06	2.57
Showers (gpm)	1.72	2.74	2.50*	1.76	2.38	NA	3.01	NA	2.61	NA	2.92	2.76

NA = Not available; Asterisk indicates those measurements with a sample less than 5.

ES.3.2 Outdoor Facility/Landscape Characteristics

Overall, 62 percent of the facilities reported using water for landscaping purposes (see Table ES-6). Lower percentages of reported water use for landscaping purposes in specific subectors is strongly related to the higher incidence of the number of establishments in these subsectors that reported the facility did not have *any* landscapable areas. The average lot size of surveyed facilities was approximately 133,000 square feet, ranging from 34,000 square feet in food product manufacturing facilities to 314,000 square feet at schools. On average, landscapable areas represented about 12

TABLE ES-6
OUTDOOR FACILITY CHARACTERISTICS

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Percent of facilities that use water for landscaping purposes	81%	68%	50%	24%	100%	36%	100%	32%	100%	30%	95%	62%
Average lot size (1,000 sq. feet)	98	98	73	61	NA	34	156	41	98	57	314	133
Percent of landscape area/total lot area	16%	13%	15%	8%	NA	0%	8%	1%	10%	3%	26%	12%
Percent of irrigated landscape area/total lot area	16%	13%	13%	7%	NA	0%	8%	1%	7%	3%	18%	10%
Percent of turf area/ landscapable area	82%	39%	33%	59%	NA	0%	22%	15%	38%	14%	64%	42%

NA = Not available

percent of the total lot area and irrigated landscape represented 10 percent of the total lot area (calculated, not reported, ratios). Among the subsectors, the percentage of landscapable areas relative to total lot area ranged from little or none (food product manufacturing, grocery stores, and wholesale grocery facilities) to about 26 percent (schools). This information will be helpful to the District in targeting water efficiency programs impacting landscape areas.

ES.3.3 Water Use Analysis

Part of the Baseline Study analysis included the collection of one-year of water consumption history for the survey participants. This yielded information on how much water was being used by the surveyed establishments (as shown in Table ES-7). The relative contributions of a given subsector's water use to overall total CII water demand in the service area will be a function of (1) the relative quantities of water use for specific purposes per establishment (high water intensive use versus low water intensive use), and (2) the number of similar types of establishments in the service area. For example, assuming that the average water per establishment of the subsectors is an accurate representation (due to relatively small sample sizes), hospitals use 27,913 gallons per day per establishment (Table ES-7, the highest per establishment use of the subsectors) and there are only 13 similar types of establishments in Santa Clara County (Table ES-1). Therefore, it could be expected that hospitals in Santa Clara County use 362,869 gallons per day (27,913 gallons per establishment * 13 establishments). Alternatively, if fabricated metal manufacturing establishments use on average

TABLE ES-7
WATER USE CHARACTERISTICS

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools
Average daily water use (gallons/ establishment)	3,918	24,087	6,435	3,011	27,913	12,001	18,843	4,690	16,027	2,538	9,342
Average daily water use per employee (gallons)	29	163	362	118	42	235	321	128	190	198	120

3,011 gallons per day per establishment, and there are reported to be 716 such facilities in Santa Clara County, then fabricated metal manufacturers in Santa Clara County collectively could be using 2,155,876 gallons per day. Overall it was found that the measured per employee water use rates for the sampled establishments in the subsectors were more closely aligned with national averages than with similar types of establishments in Southern California and other arid western cities.

A statistical analysis was also performed using the establishment-level survey data, corresponding water use records, and weather data. Water use models developed have shown that a significant amount of variance in water use can be explained by the presence (or absence) of various water-using fixtures or equipment in an establishment. Generally, higher temperatures are associated with marginal increased water use. Higher counts on scale variables such as the number of employees, the number of building square feet and the number of patients also tend to increase average daily water use of the sample. Specific water-using fixtures and equipment have been found to have different levels of influence depending on the subsector in question. The estimates consistently confirmed the water-conserving effects of low-flow toilets and showerheads and other efficiency improvements.

ES.3.4 Water Conservation Perceptions

The Baseline Study sought to understand establishment's likelihood of participation in various conservation programmatic initiatives, importance of various incentives to conserve water, and importance of various media in getting water conservation information.

On a scale of 1 to 5, where 5 is best, survey participants were asked how likely their establishment would be to participate in programs targeting increases in water use efficiency (see Table ES-8 summary highlight). The highest-rated targets for water use efficiency increases were:

TABLE ES-8
RATINGS OF TARGETS FOR IMPROVEMENTS FOR WATER USE EFFICIENCY

On a scale from 1 to 5 (where 1 is least likely, 5 is most likely) how likely would your establishment be to participate in a water conservation program targeting increases in water use efficiency in:

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Plumbing fixtures for domestic uses	3.89	**4.19**	**4.14**	3.83	3.80	**4.35**	**4.05**	3.60	**4.71**	2.53	**4.23**	3.94
Cooling & heating units	3.50	3.37	3.62	3.06	**4.00**	3.74	3.95	3.35	3.27	2.61	3.95	3.48
Water-using product mfg.	2.20*	3.56	4.00*	3.07	**4.00**	3.05	1.00*	1.00*	3.00*	3.00*	5.00*	3.08
Landscaping	3.88	3.77	3.80	3.40	**4.00**	3.50	3.61	2.50*	3.80	1.36	**4.09**	3.58
Kitchen processes & equipment	2.07	2.48	2.76	1.79	3.80	2.74	3.57	3.19	**4.38**	1.42	3.58	2.81
Laundry processes & equipment	1.20*	2.63	1.50	1.60	3.80	2.75	3.32	2.50	**4.29**	3.00*	3.80	3.03

Note: Bold numbers indicated ratings of 4 or greater; underlined numbers represent the highest rating for the subsector.
* These responses should be discounted because the majority of survey respondents in the subsector didn't respond to the question, since they felt that this type of water use was not applicable to their facility types.

- Plumbing fixtures for domestic (sanitary) uses (3.9)
- Landscape uses (3.6)
- Cooling and heating units (3.5)

Regarding their potential participation in conservation programs (see Table ES-9 summary highlights), the top five rated water conservation program activities across all subsectors were:

- Full-scale facility indoor audit prescribing operation changes in indoor water-using process and equipment with estimated benefits and costs (3.5)

- Full-scale facility landscape audit prescribing operational changes in water-using processes and equipment with estimated costs and benefits (3.48)

TABLE ES-9
RATINGS OF PARTICIPATION IN TYPES OF CONSERVATION PROGRAM

***On a scale from 1 to 5 (where 1 is least likely, 5 is most likely), how likely would your establishment be interested in participating in a*:**

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Full-scale indoor facility audit	2.98	3.56	3.31	3.17	2.20	3.55	**4.39**	3.35	**4.07**	2.47	**4.45**	3.50
Full-scale landscape audit	3.57	3.54	3.06	2.43	2.60	**4.00**	3.43	2.33	**4.07**	2.60	**4.64**	3.48
Toilet replacement program	3.22	3.60	3.59	2.94	**4.00**	**4.47**	3.27	3.58	2.40	2.70	3.95	3.43
Utility-provided recycled water for indoor uses	2.26	2.68	2.13	3.00	1.60	2.52	2.27	2.00	3.79	1.47	1.82	2.35
Utility-provided recycled water for outdoor uses	3.33	3.42	2.82	2.79	**4.00**	2.00	3.24	2.50	3.93	3.00	**4.14**	3.36
Equipment/ fixture rebate programs	3.17	3.08	3.26	2.22	**4.67**	3.26	3.73	3.67	3.27	2.35	2.83	3.14
Workshops on water use efficiency	2.35	2.27	2.86	1.98	**4.00**	2.57	3.68	2.00	2.80	1.60	**4.00**	2.65
Educational programs	2.30	2.50	2.57	1.98	3.60	2.00	3.91	2.06	2.73	1.42	**4.14**	2.61
Drought ordinance with grandfathering	2.41	3.09	3.25	1.97	3.60	1.00	3.05	2.43	3.60	2.44	2.17	2.73
Drought ordinance with no grandfathering	1.88	2.78	3.25	1.76	3.00	1.00	2.42	2.07	3.07	1.88	1.92	2.34
Voluntary landscape conversion with grants	3.29	3.92	3.17	2.71	2.60	1.00	3.27	2.57	3.36	2.53	3.95	3.24
Voluntary landscape conversion with loans	1.53	2.83	2.42	2.12	2.20	1.00	2.45	1.93	2.64	1.93	3.09	2.36
Voluntary landscape conversion no financial Incentive	1.41	1.96	1.58	1.71	2.00	1.00	1.73	1.50	2.07	1.13	2.86	1.82

Note: Bold numbers indicated ratings of 4 or greater; underlined numbers represent the highest rating for the subsector.

- Toilet replacement rebate program that provides financial incentives to replace lower efficiency toilets (3.43)
- Program to incorporate utility-provided recycled water for outdoor uses (3.36)
- Voluntary program which promotes the conversion of existing landscaping to drought-tolerant landscaping supported by grants for all establishments (3.24)

ES.3.5 Water Source Perceptions

All of the surveyed establishments used utility-provided potable water (Table ES-10). Across all subsectors, only 7 percent of the surveys establishments reported using any utility-provided recycled water, and only 3 percent reported using any on-site recycled water. Private wells or other private survey water sources were not reported by any surveyed facilities. Other reported types of water sources were primarily bottled water. Note that some establishments reported having multiple sources (e.g., utility-provided potable water and utility-provided recycled water) so the sum of all responses will not add to 100 percent.

TABLE ES-10
SOURCES OF WATER – ALL SUBSECTORS

	Percent Yes Responses
Utility-provided potable water*	98%
Utility-provided recycled water	7%
On-site recycled water	3%
Private well for potable uses	0%
Private well for landscape or other uses	0%
Private surface water source (ponds)	0%

Note: *A few respondents indicated that they did not know their water source.

Baseline Study participants were asked about their awareness of recycled water, and were specifically asked how they would best define *recycled water*. Verbatim responses were quite varied, but most respondents had the proper general concept of water that is treated and reused for specific purposes. Only 52 percent of the survey participants were aware that in parts of Santa Clara County, recycled water from the water service provider is available to establishments through separate service lines (Table ES-11). Awareness of the availability of water utility-provided recycled water was highest in the schools (82 percent), wholesale grocery facilities (70 percent), hotels/motels (68 percent), and nursing care facilities (67 percent) subsectors.

TABLE ES-11
AWARENESS OF THE AVAILABILITY OF RECYCLED WATER

Are you aware that in parts of Santa Clara County, recycled water from the water service provided is made available to establishments through separate service lines?

	Percent *Yes* Responses
Office Buildings	58%
Semiconductor Mfg.	61%
Physicians/Dentists	32%
Fab. Metal Mfg.	19%
Hospitals	60%
Food Product Mfg.	41%
Hotel/Motels	68%
Grocery Stores	23%
Nursing Care Facil.	67%
Wholesale Grocery Facil.	70%
Schools	82%
ALL SUBSECTORS	52%

The highest report of use of utility-provided recycled water was by hotels/motels (27 percent), semiconductor/electronic component manufacturers (18 percent), and office buildings (15 percent). Of those

establishments reporting using utility-provided recycled water, all indicated that the purpose of this use was for landscaping.

Only the fabricated metal product (19 percent), wholesale grocery (10 percent), and semiconductor/electronic manufacturing (4 percent) subsectors reported any on-site recycled water use. The types of water being recycled on-site included water from the metal grating/finishing process, rinsing system water, and vegetable wash water. The purposes for which the on-site recycled water was being used included vegetable wash water and water for rinsing and cooling.

ES.3.6 Future Research

The results of the CII Baseline Study provide a wealth of information to the District for planning and evaluating water conservation program initiatives. This information can be used by the District to do the following:

- Gain an understanding of the relative impacts of previous water conservation efforts in the District. Depending upon the nature and extent of previous water efficiency program initiatives, the impacts of previous water conservation efforts may be inherent in the findings of the Baseline Study (i.e., the Baseline Study shows conditions that existed during the time of the survey; conditions which may have been already impacted by the previous water conservation program initiatives of the District). The District may have quantitative or qualitative assessments of water use characteristics of CII customers prior to the Baseline Study (e.g., percentages of customers with low-flush toilets), upon which to compare Baseline Study results. Without the ability to conduct comparisons of the current Baseline Study characteristics with previous conditions, this relative impact of previous water conservation efforts may be intuitive or qualitative in nature.

- Develop a forecast of the nature and extent of future water use in the District's CII sector under current water use conditions. The average rates of water use (in Section 7) provide three benchmarks of water use by subsector for the Baseline Study sample: average daily water use per establishment, average daily water use per employee, and average daily water use per square foot of building space. Given projections of specified drivers (number of establishments per subsector, number of employees per subsector, and number of square feet of building space per subsector), these data may be used to estimate future water use in given subsectors. Given specific assumptions about the potential for water use efficiency impacts in terms of percentage reductions, future water use by subsectors may be projected under varied conservation scenarios.

- Be able to develop quantifiable estimations of the impacts of future potential alternative water conservation initiatives. The Baseline Study measured specific characteristics at a specific point in time. Future water efficiency program initiatives may target specific types of end uses. For example, the impact of a targeted initiative for replacing older, less efficient toilets may be discernable against baseline characteristics with future surveys of similar characteristics. The Baseline Study also provides detailed end use characteristics upon which potential water savings from various water efficiency program initiatives could be calculated, using specific assumptions regarding reductions, intensity of use, and market penetrations.

- Develop an effective outreach program that target specific water use conditions in the CII sector. The Baseline Study measured not only the types of end uses of water that exist within specific

subsectors, but also measured establishment and subsector perceptions and likelihood of potential future program participation. This information should be used in designing implementation conditions and targeted subsectors of water efficiency program initiatives.

As additional water efficiency programs are implemented in the District service area, it is important for planning purposes to monitor water use patterns and to evaluate the impacts of water efficiency programs. To provide feedback into the water conservation program planning (i.e., for designing acceptable and cost-effective programs), it may also be helpful to conduct evaluations of individual programs. Therefore, it is recommended that the District consider three primary components of a long-term monitoring and evaluation program:

1. Water Use Monitoring Program. With cooperation of the retail water providers, this would include tracking annual water use of major sectors and subsectors of water-using customers. This will be helpful in being able to predict water use with and without water efficient program efforts.

2. Water Efficiency Monitoring Program. This could include the estimation of water use for various purposes (e.g., toilets, showers, landscaping, cooling, etc.) and the assessment of potential water efficiency program impacts on the various components of water use to determine program savings.[1]

3. Special Studies and Periodic Surveys. This could include detailed empirical evaluations of specific water efficiency program efforts and periodic surveys to provide feedback into the water conservation planning.

[1] This type of analysis can be performed using models such as the IWR-MAIN Water Demand Management Suite or similar models.

Section 1
Introduction

The Santa Clara Valley Water District (District) is the wholesale supplier of water in California's Santa Clara County, the boundaries of which coincide exactly with the District's 1,300 square-mile service area. The District provides water to 1.7 million people via its service to 13 water retailers throughout its jurisdiction, including to the San Jose Water Company, which accounts for about half of the total water use in the District. The other major water retailers served by District include the California Water Services Company, the Gilroy Community Services Department, the Purissima Hills Water District, the City of Milpitas Community Services, the City of Morgan Hill Public Works Department, the City of Mountain View Public Services Department, the City of Palo Alto Utilities Department, the Great Oaks Water Company, the San Jose Municipal Water System, the City of Santa Clara Water Department and the City of Sunnyvale Public Works Department.

The District sought to better understand the water-using characteristics of commercial, institutional, and industrial (CII) establishments for the purpose of gaining information to more effectively target its water efficiency program efforts. Through the Baseline Study, the District specifically sought to: (1) determine the prevalent types of water-using fixtures and appliances, and (2) characterize water-using behaviors of selected CII customer groups. The insight obtained by the Baseline Study would be used by the District to design cost-effective long-term water efficiency programs and to have a baseline from which to evaluate the potential impacts of water efficiency measures. Furthermore, the study results will be useful for service area demand forecasting, conservation program marketing and design, best management practice (BMP) program implementation, and BMP program evaluation.

In cooperation with the District, the focus of the Baseline Study was refined to target selected CII customers.[2] It was deemed that the District could determine from its water retailers *how much water* was being used by selected customer groups. However, this would not provide adequate knowledge about *how customers are currently using water*. In order to meet the District objectives, the Baseline Study sought to collect information about targeted CII customers groups (or subsectors) through on-site surveys of a sample of CII establishments.

To meet the District objectives, the CII Baseline Study was developed in a systematic manner:

- Review study objectives and define study targets
- Define data to be collected
- Specify method of data collection
- Finalize study design and implementation plan
- Conduct surveys
- Conduct data analysis

[2] The definitions of commercial, institutional, and industrial (CII) customers vary among retail water providers. For the purpose of the Baseline Study the general focus was on specific types of business establishments, not on multifamily residential or agricultural accounts.

1.1 Study Methodology

Upon consultation with the District, it was determined that the primary objective of the Baseline Study was to gain knowledge of the nature and extent of current water use in the District's CII sector. The District noted that this information was important in order for the District to meet the following objectives:

- Gain an understanding of the relative impacts of previous water conservation efforts in the District
- Develop a forecast of the nature and extent of future water use in the District's CII sector under current water use conditions
- Be able to develop quantifiable estimations of the impacts of future potential alternative water conservation initiatives
- Develop an effective outreach program that target specific water use conditions in the CII sector.

These were determined to be the primary drivers of the Baseline Study. It was recognized that the District's success in meeting these objectives would be contingent upon the types of information that could be obtained from the Baseline Study. It was further recognized that the challenge for any water conservation authority such as the District in its pursuit of cost-effective program implementation is to acquire a significant amount of information about their population of CII establishments. However, an obvious constraint is to determine how much information can be obtained within specified budget constraints. Therefore, a prime decision point in the development of the Baseline Study design was to determine how much information could be obtained from how many establishments.

Upon consultation with the District it was determined that the District would be best served by the acquisition of practicable information through on-site surveys of a subset of major water-using subsectors in the District. The District was presented with a number of options that included varied number of subsectors and varied number of surveys per subsector. Upon investigation with the District of the various trade-off's associated with targeting multiple CII subsectors and the impact on sample size, the District chose to target 11 subsectors with about 20 on-site surveys per subsector. The total number of target surveys was 225.

Based upon preliminary analyses of the types of business establishments in the District, their likely contributions to overall CII water use in the District, and their potential for participating in water efficiency program initiatives, the District chose to target the 11 subsectors shown in Table 1. Preliminary analyses indicated that these 11 subsectors could potentially account for approximately 40 percent of total CII water demand in Santa Clara County.

Because the District has no direct retail water customers, it was not possible to generate a list of potential establishments to target for the surveys from District records. It was also deemed that it would not be practical to obtain listings of CII customers from the 13 retail water providers because of the differences in the customer accounting systems of the retailers would likely not classify customers similarly. Therefore, two databases were drawn from to produce random sequenced lists of establishments in the subsectors for targeting customers for the on-site surveys: the Dun &

TABLE 1 SURVEY TARGETS		
Target Subsectors	**Estimated Number of Establishments in Santa Clara County***	**Target Survey Counts**
Office Buildings	Unknown	25
Semiconductor & Other Electronic Component Manufacturers	479	25
Offices of Physicians and Dentists	2,365	23
Fabricated Metal Product Manufacturers	716	22
General Medical & Surgical Hospitals	13	5
Food Product Manufacturers	156	22
Hotels/Motels	226	22
Grocery Stores	335	22
Nursing Care Facilities	64	15
Wholesale Grocery & Related Product Facilities	190	20
Elementary & Secondary Schools	109	22
TOTAL	**4,653**	**225**

* Information obtained from U.S. Bureau of Census, County Business Patterns.

Bradstreet Million Dollar Database (State Slice of California) and the online office building directory at http://www.officedirectory.com (searched for *San Jose, CA PMSA*).

The approach for the design of the CII water use survey included the development of an indoor and an outdoor survey form, which was completed by the surveyor during the on-site interview and inspection. The survey forms are shown in Appendix A. In cases in which no water is used for outdoor purposes, only the indoor survey form was completed.

The survey form was designed to elicit responses that reveal *how* water is being used by the establishments in the targeted subsectors. This is in contrast to quantifying *how much* water is being used for varied purposes within the targeted subsectors, which would require many more extensive on-site investigations beyond the scope of this study. Table 2 highlights the various types of information that were targeted for data collection through on-site surveys of selected establishments.

The on-site surveys were initiated during the week of January 19, 2004 and continued for 20 weeks until early June 2004. Table 3 shows the breakdown of the 225 surveys completed in the targeted subsectors. Over the field survey implementation period, the field survey team completed an average of 12.5 surveys per week.

The positive response rate is defined as the percentage of establishments contacted by telephone that consented to the surveys. Some establishments were contacted but the schedulers were not successful in speaking with the individual authorized to agree to conduct the survey. These contacts were not included in the calculation of the positive response rate. Note that because of the need to schedule the office building subsector through a property manager, the response rate calculation is different from the other subsectors. For office buildings the positive response rate does not reflect the number of establishments consenting divided by number of establishments contacted, but rather the number of property managers consenting divided by the number of property managers contacted.

TABLE 2 SURVEY MEASUREMENTS	
General Site Characteristics ▪ Age of building structure ▪ Building (s) square footage ▪ Employment ▪ Subsector-specific data (number of students, number of beds, number of patients	General Conservation Perceptions ▪ Potential conservation program participation ▪ Ratings of alternative conservation programs ▪ Ratings on conservation incentives ▪ Ratings on conservation information sources
Water Source Inquiries ▪ Type of water sources ▪ Reasons for recycled water use ▪ Reasons for no recycled water use	Water Use Types/Fixture Counts ▪ Sanitary ▪ Facility cooling/heating ▪ Laundry ▪ Kitchen ▪ Special purpose uses ▪ Landscape
Appliance/Fixture Testing ▪ Toilets ▪ Urinals ▪ Faucets ▪ Showers ▪ Dishwashers ▪ Clothes washers ▪ Garbage disposals ▪ Pools/spas	Outdoor Characteristics ▪ Lot size, hardscape, landscape, turf areas ▪ Irrigation systems ▪ Controller data ▪ Outdoor pools, spas ▪ Fountains ▪ Distribution system uniformity and precipitation rate

TABLE 3
SUMMARY OF SURVEYS COMPLETED

Targeted Subsectors	Targeted Number of Surveys	Number of Surveys Completed	Positive Response Rate
Office Buildings	25	26	11%
Semiconductor/Electronic Component Mfg.	25	28	25%
Offices of Physicians or Dentists	23	22	29%
Fabricated Metal Product Mfg.	22	21	19%
General Medical/Surgical Hospitals	5	5	29%
Food Product Mfg.	22	22	51%
Hotels/Motels	22	22	41%
Grocery Stores	22	22	28%
Nursing Care Facilities	15	15	45%
Wholesale Grocery/Related Products Facilities	22	20	24%
Elementary/Secondary Schools	22	22	44%
TOTAL	**225**	**225**	

1.2 Report Overview

The following sections of this report provide the results of the site surveys. Appendix A provides the detailed *Implementation Plan* that outlined the approach and procedures for the implementation of the survey. The *Implementation Plan* was approved by the District prior to the initiation of the field surveys. Appendix A also contains the survey form that was used to collect data during the field surveys. Appendix B contains more detailed information regarding the study design and site survey implementation results. Due to the extensive nature of the data reporting for 11 subsectors and *all subsectors*, the tabulation of survey results are presented in detail in Appendix C. The following sections of the report only provide highlights of the survey results.

Section 2
Facility Characteristics

As indicated in the previous section, the Baseline Study focused on 11 water use subsectors in the District service area. The subsectors were chosen by the District for a number of reasons including: (1) the relative amounts of subsector water use in the District service area and (2) the perceived potential for water efficiency improvements in these subsectors. The following characterize the types of services offered or goods produced at the surveyed establishments in each of the subsectors:

- Office Buildings. The office building subsector was clearly the most heterogeneous of all the subsectors surveyed because no single type of operation occurred within the office building group. Business conducted within office buildings included semiconductor research, market research, police activities, administrative offices, and billing/accounting offices.

- Semiconductor and Other Electronic Component Manufacturers. The range of products produced in the semiconductor manufacturing subsector included: PC boards, integrated circuits, cell phone wafers, computer chips, integrated circuit boards, and robotics.

- Offices of Physicians or Dentists. Six of the 22 surveys conducted were dentist's offices, with the remaining surveys from physician facilities including an amniocentesis/ultrasound center, urgent care facility, and other medical practices.

- Fabricated Metal Product Manufacturers. This subsector included a range of machine shops, metal finishing facilities, industrial machinery manufacturing, metal plating, and sheet metal fabrication.

- General Medical and Surgical Hospitals. This subsector included general hospital facilities including psychiatric, surgery, laboratories, and wellness centers.

- Food Product Manufacturers. This subsector included meat processors, bakery products, candy manufacturer, and other specialty foods.

- Hotels/Motels. This subsector included a range of hotels/motels, some with restaurant/banquet facilities.

- Grocery Stores. This subsector covered a range of full-service and specialty grocery stores.

- Nursing Care Facilities. This subsector included long-term and short-term nursing care facilities and assisted living facilities.

- Wholesale Grocery and Related Products Facilities. Similar to the office building subsector, this subsector was fairly heterogeneous in types of services and products. This subsector included wholesale beverages, bakeries, fish/seafood, fresh/frozen foods, fruits/vegetables, poultry, and other general/specialty wholesale products.

- Elementary and Secondary Schools. In addition to public and private (church-affiliated) elementary/secondary school facilities, this subsector also included a school administrative facility and a maintenance facility.

Tables C-2 and C-3 of Appendix C show the selected characteristics of surveyed facilities. Table 4 shows a few highlights of the facility characteristics. In terms of the age of structure, on average, the surveyed establishments in elementary/ secondary school, food product manufacturing, nursing care facilities, and wholesale grocery subsectors were the oldest. On average, the newer building structures surveyed was in the hotel/motel and physician/dentist office subsectors. The age of structures is often perceived as indicative of the age of fixtures in the facilities and therefore, older structures are viewed as potential targets for fixture replacement or retrofit programs (though subsequent analysis of the survey data did not prove this hypothesis).

TABLE 4
GENERAL FACILITY CHARACTERISTICS

	Median Age of Structure	Median Square Footage of Buildings	Median Annual Number of Employees
Office Buildings	1980	20,000	50
Semiconductor mfg.	1982	25.500	34
Physicians/dentists	1984	3,500	18
Fabricated metal mfg.	1980	15,000	15
Hospitals	1970	176,106	500
Food product mfg.	1964	9,000	21
Hotels/motels	1985	135,000	38
Grocery stores	1977	30,000	54
Nursing care facilities	1964	36,000	88
Wholesale grocery facilities	1968	10,700	15
Schools	1960	50,884	64

Consistent with having the oldest facilities, the subsector with the highest percentage of facilities reporting remodeling was the elementary/secondary schools, with 82 percent having some type of remodeling. Of the 18 school surveys that reported some type of remodeling, 11 (61 percent) indicated that part of the remodeling effort included replacement of plumbing fixtures.

The number of employees per establishment is often considered to be a major driver of water use. In fact, water use per employee is often used as a benchmark for water use forecasting and for water conservation planning. Although it is recognized that employment at a given establishment or in a given subsector is not the only driver of water use, establishment-level or subsector-level employment is often a readily available data point upon which to calculate benchmarks.

On average, the largest facilities surveyed (in terms of square feet of buildings) included hospitals, hotels/motels and schools. Hospitals, by far, have the greatest number of employees, on average across all subsectors, followed by nursing care facilities and schools. However, in subsectors such as hospitals, nursing care facilities, schools, and hotel/motels, water use will also be strongly driven by the other users of the facilities (i.e., patients, students, and guests). The calculated value of the number of building square feet per employee (Table C-2) again shows that hotels (1,900 sq. ft. per employee) and schools (1,400 sq. ft. per employee) have larger facilities to accommodate those subsector's customers. In these two subsectors, the large square footage per employee is driven by the fact that the facility size is designed primarily to accommodate guests and students rather than employees).

Only schools, and to a lesser extent, food product manufacturing indicated substantive fluctuations in seasonal employment. The seasonal fluctuation of employment in these subsectors may also have an impact on the seasonal fluctuation in water use of these establishments. However, in the schools subsector, the seasonal drop in students or employment may be offset by increases in outdoor irrigation during the summer season.

Table C-3 shows tabulations of detailed site characteristics that are unique to specific subsectors. These tabulations may be useful in developing water conservation program planning assumptions for estimating potential savings from various water conservation measures.[3]

[3] See American Water Works Association (AWWA), 1993. Evaluating Urban Water Conservation Programs: A Procedures Manual.

Section 3
Conservation and Water Source Awareness

The District has an extensive water efficiency program, including water conservation, water recycling, and desalination. Currently, water conservation programs for businesses focus on landscape areas, technical assistance, water efficient technologies, toilet retrofits, and commercial clothes washers. The on-site surveys included questions regarding the likelihood of participation in various conservation programmatic initiatives, importance of various incentives to conserve water, and importance of various media in getting water conservation information. This information may be useful to District staff in understanding the receptivity of customers in the water use subsectors for various water conservation program initiatives and their preferences for media sources for conservation information. It should be noted that, with their ratings, the survey respondents may have either represented their own opinions or their perceived representation for the facility. Table C-4 of Appendix C reports the detailed descriptive statistics on these water conservation-related perception questions.

In its 2003 update to *Integrated Water Resources Plan*, water recycling was recognized as a key component of the District's water resources strategy. In fiscal year 2003-2004, total recycled water use in Santa Clara County was 9,881 acre-feet (or about 2.6 percent of total water supply). Currently, about 90 percent of recycled water is used for large landscape areas, 9 percent for industrial use, and 1 percent for agricultural use. By 2020, it is expected that water recycling will account for approximately 10 percent of total water use in Santa Clara County. The Baseline Study surveys also questioned participants regarding their sources of water, their understanding of the concept of recycled water, and their use of recycled watere. Table C-5 of Appendix C provides detailed descriptive statistics on survey responses regarding water sources and recycled water use.

The following sections highlight the survey findings on conservation and water source perceptions and awareness.

3.1 Water Conservation Perceptions

On a scale of 1 to 5, where 5 is best, survey participants were asked how likely their establishment would be to participate in programs targeting increases in water use efficiency (see Table 5 summary highlight). The highest-rated targets for water use efficiency increases were:

- Plumbing fixtures for domestic (sanitary) uses (3.9)
- Landscape uses (3.6)
- Cooling and heating units (3.5)

With the exception of hospitals and wholesale grocery facilities, targeting increases in water use efficiency of plumbing fixtures was the highest rated choice of all other subsectors. Hospitals reported to be more likely to participate in programs targeting heating and cooling units or landscaping. Wholesale grocery facilities, on average, gave highest ratings to targeting increases in water use efficiency in cooling and heating units.

TABLE 5
RATINGS OF TARGETS FOR IMPROVEMENTS FOR WATER USE EFFICIENCY

On a scale from 1 to 5 (where 1 is least likely, 5 is most likely) how likely would your establishment be to participate in a water conservation program targeting increases in water use efficiency in:

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Plumbing fixtures for domestic uses	3.89	**4.19**	**4.14**	3.83	3.80	**4.35**	**4.05**	3.60	**4.71**	2.53	**4.23**	3.94
Cooling & heating units	3.50	3.37	3.62	3.06	**4.00**	3.74	3.95	3.35	3.27	2.61	3.95	3.48
Water-using product mfg.	2.20*	3.56	4.00*	3.07	**4.00**	3.05	1.00*	1.00*	3.00*	3.00*	5.00*	3.08
Landscaping	3.88	3.77	3.80	3.40	**4.00**	3.50	3.61	2.50*	3.80	1.36	**4.09**	3.58
Kitchen processes & equipment	2.07	2.48	2.76	1.79	3.80	2.74	3.57	3.19	**4.38**	1.42	3.58	2.81
Laundry processes & equipment	1.20*	2.63	1.50	1.60	3.80	2.75	3.32	2.50	**4.29**	3.00*	3.80	3.03

Note: Bold numbers indicated ratings of 4 or greater; underlined numbers represent the highest rating for the subsector.
* These responses should be discounted because the majority of survey respondents in the subsector didn't respond to the question, since they felt that this type of water use was not applicable to their facility types.

Regarding their potential participation in conservation programs (see Table 6 summary highlights), the top five rated water conservation program activities across all subsectors were:

- Full-scale facility indoor audit prescribing operation changes in indoor water-using process and equipment with estimated benefits and costs (3.5)
- Full-scale facility landscape audit prescribing operational changes in water-using processes and equipment with estimated costs and benefits (3.48)
- Toilet replacement rebate program that provides financial incentives to replace lower efficiency toilets (3.43)
- Program to incorporate utility-provided recycled water for outdoor uses (3.36)
- Voluntary program which promotes the conversion of existing landscaping to drought-tolerant landscaping supported by grants for all establishments (3.24)

On a scale of 1 to 5, a rating of 4 or greater can be interpreted as strong interest in program participation. The following listing shows the highest rated programs with the subsectors that provided an aggregate rating of 4.0 or higher (note that some values may have been disregarded based on the small number of responses to the question):

- Full-scale facility indoor audit prescribing operation changes in indoor water-using process and equipment with estimated benefits and costs (3.5)
  - Schools (4.45)
  - Hotels/motels (4.39)
  - Nursing care facilities (4.07)

TABLE 6
RATINGS OF PARTICIPATION IN TYPES OF CONSERVATION PROGRAM

On a scale from 1 to 5 (where 1 is least likely, 5 is most likely), how likely would your establishment be interested in participating in a:

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Full-scale indoor facility audit	2.98	3.56	3.31	3.17	2.20	3.55	**4.39**	3.35	**4.07**	2.47	**4.45**	3.50
Full-scale landscape audit	3.57	3.54	3.06	2.43	2.60	**4.00**	3.43	2.33	**4.07**	2.60	**4.64**	3.48
Toilet replacement program	3.22	3.60	3.59	2.94	**4.00**	**4.47**	3.27	3.58	2.40	2.70	3.95	3.43
Utility-provided recycled water for indoor uses	2.26	2.68	2.13	3.00	1.60	2.52	2.27	2.00	3.79	1.47	1.82	2.35
Utility-provided recycled water for outdoor uses	3.33	3.42	2.82	2.79	**4.00**	2.00	3.24	2.50	3.93	3.00	**4.14**	3.36
Equipment/ fixture rebate programs	3.17	3.08	3.26	2.22	**4.67**	3.26	3.73	3.67	3.27	2.35	2.83	3.14
Workshops on water use efficiency	2.35	2.27	2.86	1.98	**4.00**	2.57	3.68	2.00	2.80	1.60	**4.00**	2.65
Educational programs	2.30	2.50	2.57	1.98	3.60	2.00	3.91	2.06	2.73	1.42	**4.14**	2.61
Drought ordinance with grandfathering	2.41	3.09	3.25	1.97	3.60	1.00	3.05	2.43	3.60	2.44	2.17	2.73
Drought ordinance with no grandfathering	1.88	2.78	3.25	1.76	3.00	1.00	2.42	2.07	3.07	1.88	1.92	2.34
Voluntary landscape conversion with grants	3.29	3.92	3.17	2.71	2.60	1.00	3.27	2.57	3.36	2.53	3.95	3.24
Voluntary landscape conversion with loans	1.53	2.83	2.42	2.12	2.20	1.00	2.45	1.93	2.64	1.93	3.09	2.36
Voluntary landscape conversion no financial Incentive	1.41	1.96	1.58	1.71	2.00	1.00	1.73	1.50	2.07	1.13	2.86	1.82

Note: Bold numbers indicated ratings of 4 or greater; underlined numbers represent the highest rating for the subsector.

- Full-scale facility landscape audit prescribing operational changes in water-using processes and equipment with estimated costs and benefits (3.48)
  - Schools (4.64)
  - Nursing care facilities (4.07)
  - Food product manufacturers (4.00, small sample size noted, See Table C-4 in Appendix C)

- Toilet replacement rebate program that provides financial incentives to replace lower efficiency toilets (3.43)
  - Food product manufacturers (4.47)
  - Hospitals (4.00)

- Program to incorporate utility-provided recycled water for outdoor uses (3.68)
  - Schools (4.14)
  - Hospitals (4.0)

- Water efficient equipment and appliance rebate programs that provide financial incentives to replace lower efficiency equipment (3.14)
  - Hospitals (4.67)

- Water agency sponsored workshops on water efficiency opportunities (2.65)
  - Schools (4.0)
  - Hospitals (4.0)

- Educational programs on water efficiency products and opportunities (2.61)
  - Schools (4.0)

This listing is suggestive of the subsectors who should be primary or, at least, initial targets of the water conservation program efforts of these types.

From a subsector perspective, the following shows the highest rated conservation program for each subsector:

- Office Buildings. Full-scale facility audit for outdoor uses (3.57)

- Semiconductor/Electronic Manufacturers. Voluntary program to convert existing landscaping supported by grants (3.92)

- Offices of Physicians/Dentists. Toilet replacement program (3.59)

- Fabricated Metal Product Manufacturers. Full-scale facility audit for indoor uses (3.17)

- Hospitals. Equipment/appliance rebate programs (4.67)

- Food Product Manufacturers. Toilet replacement program (4.47)

- Hotels/Motels. Full-scale facility audit for indoor uses (4.39)

- Grocery Stores. Equipment/appliance rebate programs (3.67)

- Nursing Care Facilities. Full-scale facility audit for both indoor and outdoor uses (both rated 4.07)

- Wholesale Grocery Product Facilities. Program to incorporate utility-provided recycled water for outdoor uses (3.00) (though in subsequent sections, it will be reported that very few of the surveyed facilities (30 percent) in this subsector actually used water for landscaping purposes)

- Schools. Full-scale facility audit for outdoor uses (4.64)

If conservation programs are designed to target specific subsectors, their top-rated programs should be given priority consideration.

Regarding incentives to conserve water (see Table 7 for summary highlights), all three specified reasons (saving money, protecting environment, and preventing water shortages) were rated very high with very little variance to distinguish among the three (i.e., aggregate ratings ranged from 4.55 to 4.69). Overall, office buildings, hospitals, grocery stores, and schools rated saving money as the

best incentive. Fabricated metal manufacturers rated protecting the environment as the best incentive. All other subsectors rated preventing future water shortages as the best incentive to conserve water.

TABLE 7
RATINGS OF INCENTIVES TO CONSERVE WATER

On a scale from 1 to 5 (where 1 is least important, 5 is most important), how would you rate the following as incentives to conserve water:

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Save money	4.57	4.46	4.55	4.31	4.80	4.48	4.55	4.80	4.47	4.60	4.95	4.58
Protect environment	4.30	4.57	4.77	4.68	4.40	4.52	4.20	4.65	4.47	4.45	4.86	4.55
Prevent future shortages	4.30	4.89	4.86	4.64	4.60	4.81	4.55	4.65	4.73	4.65	4.77	4.69

Note: Underlined numbers represent the highest rating for the subsector.

3.2 Sources of Conservation Information

The District does have an extensive water conservation education and outreach program. In fiscal year 2003-2004, it encompassed:

- Water Use Efficiency Nursery Program
- Community Events
- Fall Home and Garden Show
- Summer Water Conservation Campaign (including television, radio and newspaper advertisements)
- May Water Awareness Campaign
- Going Native Garden Tour
- ET Irrigation Controller Workshops
- Landscape Irrigation Workshops for Professionals
- Cooling Tower Workshop

The survey also sought to rate the extent of which various media contributed to awareness of water conservation opportunities (see Table 8 for summary highlights). Survey participants were asked to rate on a scale of 1 to 5 (where 1 is least important and 5 is most important) what extent various media sources contributed to their awareness of new water conservation opportunities. On a scale from 1 to 5, overall ratings received (i.e., *all subsectors*) for each of the media sources were less than the midpoint of *3*, which does not provide resounding support for receiving this information but may be indicative of the lesser of the evils. Across all subsectors, the highest rated media sources were word-of-mouth by other water professionals (2.87), television advertisements or programs

(2.85), information/consultation provided by the District (2.76), and newspaper stories and advertisements (2.56).

TABLE 8
RATINGS OF IMPORTANCE OF MEDIA FOR CONSERVATION AWARENESS

On a scale from 1 to 5 (where 1 is least important and 5 is most important), to what extent has the following media contributed to your awareness of new water conservation opportunities:

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Newspaper stories or advertisements	2.74	2.82	2.55	2.05	2.20	2.10	2.27	2.80	2.87	2.15	3.36	2.56
Radio advertisements or programs	2.37	2.64	2.32	2.05	2.20	1.76	1.82	2.40	3.33	1.90	1.27	2.16
Television advertisements or programs	2.29	3.36	3.27	2.48	3.20	3.52	3.23	2.85	3.53	2.25	1.59	2.85
Internet-based research	1.58	1.57	2.00	2.00	2.80	2.10	1.45	1.45	2.20	1.40	2.59	1.85
Word-of-mouth from other water professionals	2.79	3.11	2.55	2.26	3.80	1.43	4.23	2.25	3.40	2.90	3.55	2.87
Direct business solicitation	2.05	1.75	1.73	1.62	1.80	1.24	2.36	1.15	2.40	1.50	2.36	1.80
Professional periodicals	2.05	1.88	2.55	1.38	2.40	1.33	2.05	1.25	2.07	1.60	2.23	1.85
Professional conferences	1.63	1.39	1.95	1.60	2.40	1.05	2.14	1.10	1.67	1.45	1.73	1.59
Information/ consultation from District	2.68	2.75	3.00	2.79	1.80	2.86	2.41	2.40	2.73	3.10	3.09	2.76

Note: Underlined numbers represent the highest rating for the subsector.

The following is a listing of the highest rated media sources with the corresponding subsectors that provided highest ratings for the specific media source as contributing to their awareness of water conservation opportunities:

- Word of mouth via other water professionals (2.87)
  - Hotels/motels (4.23)
  - Hospitals (3.80)
  - Schools (3.55)
  - Nursing care facilities (3.40)

- Television advertisements or programs (2.85)
  - Nursing care facilities (3.53)
  - Food product manufacturers (3.52)

- Information and/or consultation provided by District (2.76)
  - Wholesale grocery facilities (3.10)
  - Schools (3.09)
  - Office of physicians/dentists (3.00)

- Newspaper stories or advertisements (2.56)
  - Elementary/secondary schools (3.36)

From a subsector perspective, the following shows the highest rated media source for each subsector:

- Office Buildings. Word-of-mouth by other water professionals (2.79)
- Semiconductor/Electronic Manufacturers. Television advertisements or programs (3.36)
- Offices of Physicians/Dentists. Television advertisements or programs (3.27)
- Fabricated Metal Product Manufacturers. Information/consultation provided by the District (2.79)
- Hospitals. Word-of-mouth by other water professionals (3.80)
- Food Product Manufacturers. Television advertisements or programs (3.52)
- Hotels/Motels. Word-of-mouth by other water professionals (4.23)
- Grocery Stores. Television advertisements or programs (2.85)
- Nursing Care Facilities. Television advertisements or programs (3.53)
- Wholesale Grocery Product Facilities. Information/consultation provided by the District (3.10)
- Schools. Word-of-mouth by other water professionals (3.36)

If conservation programs are designed to target specific subsectors, their higher rated media sources should be given due consideration.

3.3 Water Source Perceptions

The District provides water to local water retail agencies, which in turn provides potable water to its customers. Through the South Bay Water Recycling Program, the South County Recycled Water Program, the City of Palo Alto Water Quality Control Plant, and the City of Sunnyvale Water Pollution Control Plant, there are limited amounts of recycled water available for use in Santa Clara County. Currently, recycled water is primarily used for large landscape areas and, to a much lesser extent, for industrial uses. Also, given the availability of groundwater resources, another potential water supply is direct use of the groundwater through private wells. The Baseline Study survey sought to quantify the number of customers in the designated subsectors that used various water sources. Table C-5 of Appendix C provides a detailed tabulation of the survey responses of questions related to water sources and water recycling.

All of the surveyed establishments used utility-provided potable water. However, the tabulation (Table 9) shows slightly less than 100 percent of utility-provided potable water use because of the few respondents who indicated that they didn't know anything about their water source (i.e., a response of don't know). Across all subsectors, only 7 percent of the surveys establishments reported using any utility-provided recycled water, and only 3 percent reported using any on-site recycled water. Private wells or other private survey water sources were not reported by any surveyed facilities. Other reported types of water sources were primarily bottled water. Note that

some establishments reported having multiple sources (e.g., utility-provided potable water and utility-provided recycled water) so the sum of all responses will not add to 100 percent.

TABLE 9
SOURCES OF WATER – ALL SUBSECTORS

	Percent *Yes* Responses
Utility-provided potable water*	98%
Utility-provided recycled water	7%
On-site recycled water	3%
Private well for potable uses	0%
Private well for landscape or other uses	0%
Private surface water source (ponds)	0%

Note: *A few respondents indicated that they did not know their water source.

Baseline Study participants were asked about their awareness of recycled water, and were specifically asked how they would best define *recycled water*. Verbatim responses were quite varied, but most respondents had the proper general concept of water that is treated and reused for specific purposes. Only 52 percent of the survey participants were aware that in parts of Santa Clara County, recycled water from the water service provider is available to establishments through separate service lines (Table 10). Awareness of the availability of utility-provided recycled water was highest in the schools (82 percent), wholesale grocery facilities (70 percent), hotels/motels (68 percent), and nursing care facilities (67 percent).

TABLE 10
AWARENESS OF THE AVAILABILITY OF RECYCLED WATER

Are you aware that in parts of Santa Clara County, recycled water from the water service provided is made available to establishments through separate service lines?

	Percent *Yes* Responses
Office Buildings	58%
Semiconductor Mfg.	61%
Physicians/Dentists	32%
Fab. Metal Mfg.	19%
Hospitals	60%
Food Product Mfg.	41%
Hotels/Motels	68%
Grocery Stores	23%
Nursing Care Facilities	67%
Wholesale Grocery Facil.	70%
Schools	82%
ALL SUBSECTORS	52%

The highest report of use of utility-provided recycled water was by hotels/motels (27 percent), semiconductor/electronic component manufacturers (18 percent), and office buildings (15 percent). Of those establishments reporting using utility-provided recycled water, all indicated that the purpose of this use was for landscaping.

Only the fabricated metal product (19 percent), wholesale grocery (10 percent), and semiconductor/electronic manufacturing (4 percent) subsectors reported any on-site recycled water use. The types of water being recycled on-site included water from the metal grating/finishing process, rinsing system water, and vegetable wash water. The purposes for which the on-site recycled water was being used included vegetable wash water and water for rinsing and cooling.

Of those few facilities using some type of recycled water, the primary reasons for using this recycled water included saving money (39 percent), preventing future shortages (35 percent) and protecting the environment (26 percent). Note that these were prespecified options provided to the survey respondents.

Across all subsectors, the highest rated reason for not using utility-provided recycled water was that they had no service connections to the facility (50 percent overall). However, food product manufacturers (52 percent) and wholesale groceries facilities (45 percent) reported that a primary reason for not using utility-provided recycled water was that the water quality was too poor. The

hotel/motel subsector listed costly equipment changes (50 percent) as its primary reason for not using utility-provided recycled water.

Of those establishments not currently having access to utility-provided recycled water, 57 percent reported that they would use this type of water if made available. The highest percentage of response for willingness to use recycled water, if available, was for nursing care facilities (93 percent), elementary/secondary schools (84 percent), and fabricated metal product manufacturers (75 percent). Of those who do currently have access to utility-provided recycled water but choose not to use it, 61 percent indicated they would be more likely to use it during a severe drought or water shortage.

Section 4
Types of Water Uses

One of the primary objectives of the Baseline Study and a primary focus of the on-site surveys was to determine *how customers are using water*. How customers use water can be defined by the types of water-using fixtures and appliances that exists in given establishments (these are considered *end uses* of water). Meaningful assessments of the efficiency of water use cannot be made by the District without separating indoor and outdoor uses into their various end uses. Knowledge about end uses of water will allow the District to more effectively target conservation programs to particular end uses and make more accurate estimates of potential water savings.

Table C-6 of Appendix C shows the tabulation of all reported water uses, fixtures and appliances by subsector. Table 11 provides an overview of the types of water uses and the percentage of surveyed facilities with that reported type of use. As would be expected, the existence of specific water uses is often a function of the services offered or goods produced by establishments in the subsectors. As reported, the percentage of facilities with the specified use is a function of the affirmative responses divided by the total number of response (n) in each subsector. As shown in Table 12, the mean (average) number of fixtures or appliance reported is based only on those establishments which have the specified use.[4] The following sections provide descriptive information on the types of water uses and numbers of fixtures and appliances by the subsectors.

TABLE 11
PERCENTAGE OF FACILITIES WITH REPORTED TYPE OF WATER USE

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Domestic/ sanitary	100	100	100	100	100	100	100	100	100	100	100	100
Facility cooling & heating	96	86	45	71	80	100	95	82	100	70	95	84
Once-through cooling	81	46	27	52	40	36	55	55	47	25	50	48
Laundry	0	0	18	5	80	27	86	5	100	0	14	24
Kitchen	88	79	82	62	100	77	91	77	93	65	95	81
Ice-making	8	18	9	0	100	32	95	77	100	35	27	39
Washing & sanitation	35	50	68	67	60	68	32	64	100	70	86	62
Maintenance shops	15	32	9	19	20	23	27	0	40	10	14	19
Laboratories	8	46	59	19	60	18	0	0	7	0	18	20
Process water for product mfg..	4	71	0	81	0	77	0	0	0	45	0	28
Water purification	15	71	32	38	100	55	64	41	80	20	5	43
Wastewater pretreatment	4	7	5	14	0	23	0	0	0	10	0	9
Miscellaneous use	8	21	50	0	60	9	5	14	47	0	0	14
Landscape use	81	68	50	24	100	36	100	32	100	30	95	62
Other water features (pools, spas, fountains)	8	0	0	0	40	0	82	0	20	0	36	15

[4] The median values (shown in Table C-6) are also based only on those establishments that have the specified use, and represents the point in the data set that has half of the frequencies of response above it and half of the frequencies of response below it. In some cases, the median value may be more representative of the sample as a whole. Large differences between the mean and median values of a specific variable may indicate the presence of several data points in the data set that skewed the mean value.

TABLE 12
MEAN FIXTURE COUNTS

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Restrooms	6.85	4.11	5.05	3.57	118.00	3.18	181.36	2.67	50.13	2.95	12.23	28.07
Toilets	14.79	8.96	6.00	5.14	125.00	4.50	197.14	3.59	50.93	3.90	26.45	33.41
Urinals	4.50	3.04	3.14	2.20	9.67	2.17	4.44	1.94	1.00	1.77	14.00	4.53
Waterless urinals	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	3.00	2.50
Showers	1.44	2.36	1.50	1.00	55.80	1.50	193.24	2.00	22.53	1.00	40.83	61.43
Restroom faucets	14.00	8.04	6.86	4.71	125.20	3.77	200.33	3.05	49.80	3.35	24.78	32.47
Drinking fountains	4.22	1.94	2.17	1.22	9.00	2.17	2.14	1.33	2.00	1.00	13.75	4.46
Cooling towers	1.75	1.67	1.33	1.00	2.00	3.50	1.25	1.00	0.00	1.50	0.00	1.68
Once-through cooling: air conditioners	6.24	8.50	1.67	2.70	13.00	4.33	2.89	1.40	27.75	1.60	18.90	8.02
Once-through cooling: air compressors	4.88	2.40	4.33	1.73	9.50	2.29	3.83	5.00	1.00	1.33	1.67	3.25
Commercial washing machines	0.00	0.00	1.00	0.00	2.50	1.33	2.33	0.00	2.67	0.00	1.00	2.26
Self-service washing machines	0.00	0.00	0.00	0.00	1.00	1.00	1.85	1.00	2.50	0.00	1.50	1.72
Dishwashing machines	2.55	1.83	1.00	1.50	1.00	1.00	1.68	0.00	2.92	1.00	1.27	1.78
Kitchen faucets	3.36	1.90	1.44	1.27	5.40	3.40	9.05	4.00	7.33	1.38	3.20	3.81
Food steamers	0.00	0.00	0.00	0.00	1.00	1.00	1.25	1.00	1.33	0.00	2.00	1.23
Garbage disposals	4.07	1.80	2.25	1.00	1.50	1.67	2.10	1.00	6.08	1.00	2.18	3.03
Ice-making machines: water-cooled	0.00	0.00	1.00	0.00	0.00	1.00	3.00	1.00	1.00	1.00	1.00	1.20
Ice-making machines: air-cooled	2.00	1.00	1.50	0.00	8.40	1.00	4.55	1.47	1.45	2.80	2.75	2.89
Utility (general cleaning) faucets	2.50	1.92	5.22	2.38	13.33	6.22	5.20	2.67	5.89	2.30	3.00	3.95
Maintenance area faucets	1.50	1.33	1.00	0.00	2.00	1.00	1.00	1.00	1.00	1.00	3.00	1.52
Laboratory faucets	6.00	5.25	7.00	2.00	8.00	1.75	0.00	0.00	2.00	0.00	11.33	5.97
Process water purification equipment	4.33	6.26	7.33	3.50	5.60	2.11	3.30	1.22	3.75	1.25	0.00	4.07
Swimming pools	0.00	0.00	0.00	0.00	0.00	0.00	1.06	0.00	0.00	0.00	1.20	1.09
Jacuzzis/spas	0.00	0.00	0.00	0.00	1.00	0.00	2.81	0.00	1.00	0.00	0.00	2.61
Fountains	2.00	0.00	0.00	0.00	1.00	0.00	2.50	0.00	1.00	0.00	1.00	1.73

Note: The mean (average) number of units reported is based only on those establishments which have the specified use.

4.1 Sanitary Uses

As would be expected, all facilities use water for the sanitary needs of employees and, in some cases, the sanitary needs of customers and other users of the facility. As shown in Table 12, concentrations of plumbing fixtures for sanitary uses are greatest in hotels/motels (181 average number of restrooms per establishment), hospitals (118 restrooms), nursing care facilities (50 restrooms), and schools (12 restrooms). This concentration is also reflected in the average number of toilets per establishment: hotels (197), hospitals (125), nursing care facilities (51), and schools (26).

Urinals were available plumbing fixtures in 69 percent of the surveyed establishments, with the greatest percentage reported in office buildings (96 percent), elementary/secondary schools (95 percent), and semiconductor/electronic component manufacturers (93 percent). Schools and hospitals reported the greatest number of urinals per site, with an average of 14 and 10 urinals per site, respectively.

Across all subsectors, showers were available in only 37 percent of surveyed facilities, but were reported in all hotels/motels (193 showers per site), hospitals (56), and nursing care facilities (23).

The potential for increases in water use efficiency in plumbing fixtures are often the target of water conservation programmatic efforts. The observed flow rates of various plumbing fixtures will be further explored in Section 5.

4.2 Facility Cooling and Heating[5]

Across all subsectors, 84 percent of the surveyed facilities reported using water for some type of facility cooling and heating. Cooling and heating systems often use large volumes of water, and may be potential targets for increases in water use efficiency. Cooling towers were most frequently reported at hospitals (60 percent), grocery stores (41 percent), hotels/motels (36 percent), semiconductor manufacturers (36 percent), and office buildings (31 percent). Cooling towers, specifically those using conventional water treatments (blowdown), are often targets for increases in water use efficiency. Evaporative cooling towers with chemical treatment can be considered a water conservation technology. Conservation of water from cooling towers might be achieved by reducing blowdown to minimal levels for operational efficiency, recycling water, or using recycled water for cooling tower make-up.

Across all subsectors, 37 percent reported using boilers for facility cooling/heating, with the highest percentages reported in hospitals (80 percent), hotels/motels (73 percent), food product manufacturers (64 percent), elementary/secondary schools (55 percent), and nursing care facilities (53 percent). Opportunities for water conservation of boilers may include eliminating excessive blowdown, and eliminating mixing valve water.

Forty-eight percent of the surveyed establishments reported some type of once-through cooling system, with the highest percentages reported in office buildings (81 percent), hotels/motels (55 percent), grocery stores (55 percent), and elementary/secondary schools (50 percent). This includes equipment such as air conditioners or air compressors, which are cooled by a single-pass flow of water. Opportunities for increases in water use efficiency include replacement of equipment with air-cooled equipment, connecting the equipment to a recirculating cooling system, and reusing the water for other purposes (California DWR, 1994).

4.3 Laundry Facilities

Across all subsectors, 24 percent of establishments reported having laundry facilities on site, with the highest percentage reported in nursing homes (100 percent), hotels/motels (86 percent),

[5] There are a number of references addressing water conservation opportunities in cooling systems. See *2002/2003 Cooling Water Guide*, City of San Jose; *Water Conservation Guide for Cooling Towers and other Cooling-Related Uses of Water*, City of Phoenix; *Water Efficiency Guide for Business Managers and Facility Engineers*, 1994, California DWR.

hospitals (80 percent) and food product manufacturers (27 percent). All remaining subsectors either reported less than 25 percent of facilities had laundry facilities on site or none at all. Of those facilities that had on-site laundry facilities, on average, there were 2.3 commercial washing machines on site and 1.7 self-service washing machines on site. Further exploration of the washing machines sampled during the on-site surveys is reported in Section 5. There have been substantial efforts, particularly in California, to promote water-efficient clothes washing machines through rebate programs. Currently, the District has a Commercial Clothes Washer Rebate Program, offering rebates between $275 and $450 for each purchased or leased commercial high-efficiency clothes washer. However, this program is currently focused on laundromats and apartment complexes.

As indicated by the responses to the conservation perception questions on the survey form, nursing care facilities, hospitals, schools, and hotels indicated a higher level of interest in participating in water conservation programs targeting increases in water use efficiency in laundry processes and equipment. Furthermore, from the conservation perception questions on the survey form, hospitals and grocery stores provided their highest ratings for likelihood of conservation program participation for "water efficient equipment and rebate programs that provide financial incentives to replace lower efficiency equipment."

4.4 Kitchen Facilities

Across all subsectors, 81 percent of establishments reported having kitchen facilities on site, with the highest percentages reported by hospitals (100 percent), elementary/secondary schools (95 percent), nursing care facilities (93 percent), and hotels/motels (91 percent). Dishwashing machines were reported by 37 percent of the surveyed establishments. Further exploration of the dishwashing machines sampled during the on-site surveys is reported in Section 5. Although standard dishwashing machines tend to use significantly less water than clothes washers, there may be opportunities to promote water efficient dishwashers at part of a rebate program. EPA's Energy Star program provides listings of energy-efficient dishwashers; however, they have not focused on water efficiency as a qualifying factor. Furthermore, the Energy Star listings appear to focus on residential-types of dishwashers rather than high capacity dishwashers that may be used in commercial settings.

On average, there were 3.81 kitchen faucets at sites that reported having these fixtures, ranging from 1.27 at fabricated metal product manufacturers to 9.05 at hotels/motels. On average, pre-rinse sprayers were reported at 27 percent of the surveyed sites, with 15 percent reported to be high-flow and 13 percent reported to be low-flow. The prevalence of pre-rinse sprayers ranged from 4 percent at office buildings to 60 percent at hospitals. The California Urban Water Conservation Council (CUWCC), particularly targeting the food service industry, has been promoting the use of pre-rinse spray values as a cost-effective conservation measure for reducing water use in kitchen areas. In fact, between October 2002 and December 2003, the CUWCC and its participating agencies (including the District) have provided free pre-rinse spray valves and free installation for food service facilities. The District is a major funding partner of this program in Santa Clara County, and approximately 1,000 valves were distributed and installed in Santa Clara County during this period.

As indicated by the responses to the conservation perception questions on the survey form, nursing care facilities, hospitals, schools, and hotels indicated a higher level of interest in participating in water conservation programs targeting increases in water use efficiency in kitchen processes and equipment. Furthermore, from the conservation perception questions on the survey form, hospitals

and grocery stores provided their highest ratings for likelihood of conservation program participation for "water efficient equipment and rebate programs that provide financial incentives to replace lower efficiency equipment."

Thirty-three percent of all surveyed establishments reported using garbage disposals, with the highest percentage reported at nursing care facilities (87 percent) and hospitals (80 percent). Further exploration of the garbage disposals sampled during the on-site surveys is reported in Section 5.

Thirty-nine percent of surveyed facilities reported having ice-making machines, with the highest percentage reported by nursing care facilities (100 percent), hospitals (100 percent), hotels/motels (95 percent), and grocery stores (77 percent). All remaining subsectors either reported less than 35 percent of facilities had ice-making machines on site or none at all. The more conserving air-cooled machines were more frequently reported by 33 percent of all establishments compared to water-cooled machines at 4 percent.

4.5 Washing and Sanitation Uses

Water used for general facility washing and sanitation was reported by 62 percent of all facilities, with the highest percentage reported by nursing care facilities (100 percent) and schools (86 percent). Sterilization equipment such as autoclaves was most commonly found in hospitals (60 percent, which may have been underreported, as all hospital likely have such equipment) and offices of physicians/dentists (68 percent). Forty-one percent of the establishments had general utility faucets and 11 percent reported having water-based sweeping equipment. On average, there were 3.95 general cleaning faucets per establishment.

Identification of the potential for increases in water use efficiency of general washing and sanitation water uses may be best accomplished through the conduct of full-scale facility audits. From the conservation perception questions on the survey form, the subsectors that provided the highest ratings on their likelihood of participating in a "full-scale facility audit prescribing operational changes in indoor water-using processes and equipment" were schools, hotels/motels, and nursing care facilities. Of all possible conservation program options, fabricated metal product manufacturers rated indoor facility audits as their top choice.

4.6 Process Water Uses

Across all subsectors, 28 percent reported using water for product manufacturing or preparation. However, as expected, this was highest in the manufacturing industries (fabricated metal product manufacturers, 81 percent; food product manufacturing, 77 percent; semiconductor manufacturing, 71 percent) and to a lesser extent in the wholesale grocery facilities (45 percent). Only the food product manufacturer subsector had a substantive percentage of establishments reporting using water as part of the product (64 percent). Product rinsing units; milling, drilling, and cutting fluids, and manufacturing equipment cooling were more prevalent uses in the semiconductor manufacturing, fabricated metal product manufacturing, food product manufacturing, and wholesale grocery facilities. As with the washing and sanitation uses of water, identification of the potential for increases in water use efficiency of process water uses may be best accomplished through the conduct of full-scale facility audits.

4.7 Water Purification Equipment

Forty-three percent of all establishments reported using some type of water purification equipment, with the highest numbers reported in hospitals (100 percent), nursing care facilities (80 percent), and semiconductor manufacturing facilities (71 percent). Water softeners (24 percent), and water filters (20 percent), and deionization/ion exchange units (11 percent) were the most common types of reported water purification equipment.

4.8 Landscape Uses

Overall, 62 percent of the facilities reported using water for landscaping purposes. By subsector, this included:

- Hospitals: 100 percent
- Hotels/Motels: 100 percent
- Nursing Care Facilities: 100 percent
- Schools: 95 percent
- Office Buildings: 81 percent
- Semiconductor/Electronic Manufacturers: 68 percent
- Offices of Physicians/Dentists: 50 percent
- Food Product Manufacturers: 36 percent
- Grocery Stores: 32 percent
- Wholesale Grocery Product Facilities: 30 percent
- Fabricated Metal Product Manufacturers: 24 percent

Lower percentages of reported water use for landscaping purposes in specific subectors is strongly related to the higher incidence of the number of establishments in these subsectors that reported the facility did not have *any* landscapable areas.

Outdoor landscape water use generally provides significant opportunities for increases in water use efficiency, particularly related to optimizing automatic irrigation systems, promoting water-efficient plantings, and promoting recycled water for irrigation. From the conservation perception questions on the survey form, the subsectors that provided the highest ratings on their likelihood of participating in a "full-scale facility audit prescribing operational changes in outdoor water-using processes and equipment" were schools and nursing care facilities. Of all possible conservation program options, office building survey respondents rated outdoor facility audits as their top choice for likelihood of program participation.

4.9 Other Water Features

Overall, 10 percent of surveyed facilities reported having swimming pools, 8 percent reported having spas, and 5 percent reported having fountains. Of course, these features were concentrated in a few subsectors. Swimming pools were reported in hotels/motels (77 percent) and schools (23 percent). Spas were reported in hotels/motels (73 percent) and hospitals (20 percent); and fountains were reported in hospitals (20 percent), hotels/motels (18 percent), nursing care facilities (13 percent), schools (9 percent), and office buildings (8 percent). Increases in water efficiency with these

features can be achieved through the promotion of covers for swimming pools and spas to reduce evaporation loss and recycling systems for fountains.

4.10 Pressure Regulators

Pressure regulators were reported at 13 percent of the surveyed establishments for indoor use and at 8 percent for outdoor uses. Average indoor water pressures at the highest available indoor fixture ranged from 62 pounds per square inch (PSI) at hotels/motels to 73 PSI at grocery stores.

4.11 Other Indoor Water Uses

Twenty-one percent of the surveyed establishments reported having other indoor water uses that were not specifically addressed in the survey form. Types of water uses reported included: fish tanks, coffee makers, hair salons, mini-bar faucets (hotels), classroom sinks (schools), food produce misters (grocery stores), emergency eyewashes (fabricated metal manufacturers), and exam room sinks/faucets (physicians/dentists offices).

4.12 Summary

Planning water conservation programs often requires making specific assumptions regarding the types of water uses and the number of fixtures/appliances at specific types of establishments (Table C-6 of Appendix C). The data obtained from this CII Baseline Study will provide a substantial basis for planning water conservation programs for the subsectors addressed in the study. These data may be used to design the implementation strategies of programs, to target programmatic activities, to estimate potential savings, and to evaluate potential costs and benefits.[6]

As indicated previously, the number of employees per establishment is often considered to be a major driver of water use. In fact, water use per employee is often used as a benchmark for water use forecasting and for water conservation planning. Although it is recognized that employment at a given establishment or in a given subsector is not the only driver of water use, establishment or subsector employment is often a readily available data point upon which to standardize water use (to account for various sizes of establishments) and calculate benchmarks. Table C-6 and Table 12 provides average fixture/appliance counts by subsector for those parameters measured in the on-site surveys. The calculated end use characteristics in Table 13 further provides calculated statistics from the site survey data for selected fixtures/appliances that measures the number of fixtures/appliances per employee and the number of employees per fixture/appliance (more detailed statistics are provided in Table C-7 of Appendix C). For example, if the District were interested in pursuing a toilet replacement program for a specific subsector, it could develop target estimates of the total number of toilets in the subsector by either: (1) multiplying the average number of toilets per establishment by the number of establishments in the subsector or (2) multiplying the number of toilets per employee by the number of employees in the subsector.

The data shown in Table 13 (and Table C-7) may also provide information on the intensity or frequency of use of particular fixture/appliances.[7] For example, in a subsector where there would be

[6] See American Water Works Association (AWWA), 1993. Evaluating Urban Water Conservation Programs: A Procedures Manual.
[7] This type of end use data is useful for estimating water conservation savings potential using end use models such as the IWR-MAIN Water Demand Management Suite.

TABLE 13
CALCULATED END USE CHARACTERISTICS

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Square feet per employee	531	707	618	1058	292	703	1947	566	378	1111	1433	793
Number of toilets per employee	0.28	0.21	0.21	0.30	0.25	0.20	4.28	0.10	0.60	0.24	0.38	0.67
Number of showers per employee	0.02	0.04	0.02	0.10	0.15	0.11	4.02	0.03	0.31	0.11	0.32	1.16
Number of urinals per employee	0.08	0.07	0.09	0.12	0.01	0.05	0.06	0.03	0.01	0.09	0.19	0.09
Number of faucets per employee	0.34	0.32	0.60	0.45	0.31	0.51	4.36	0.17	0.69	0.34	0.39	0.80
Number of dishwashers per employee	0.05	0.01	0.09	0.04	0.01	0.06	0.05	0	0.03	0.01	0.03	0.04
Number of clothes washers per employee	0	0	0.04	0	0.01	0.07	0.11	0.05	0.04	0	0.01	0.07
Number of restrooms per employee	0.13	0.14	0.19	0.25	0.24	0.18	4.12	0.08	0.59	0.20	0.19	0.59

limited use of fixtures beyond employees, the number of employees per fixture may provide guidance on the amount of water used by fixtures and thereby provide a basis for estimating potential water savings if a conservation measure where implemented.

As part of the on-site surveys, samples were taken of various water-using fixtures including toilets, urinals, faucets, showers, dishwashers, clothes washers, garbage disposals, swimming pools, and spas. Section 5 describes the characteristics of the sampled fixtures/appliances.

Section 5
Measured Fixtures, Appliances and Other Water Features

Upon completion of verbal inquires of the survey form, the field surveyor asked to be shown around the establishment in order to collect more detailed information on all or a subset of water-using appliances and fixtures. For sites with a large number of fixtures and appliances, the goal was to sample 10 percent of the fixtures and appliances at various locations in the establishment, with a limit of 10 fixtures per type. The types of fixtures and appliances for which measurements were sought included: toilets, urinals, faucets, showers, dishwashers, clothes washers, garbage disposals, and other water features (including pools, spas, and fountains). The following sections detail the findings of the measurements.

5.1 Toilet Data

At each survey site, the field survey team was directed to sample about 10 percent of available toilets (up to a maximum of 10) and to identify selected characteristics of the sampled toilets including type of mount, make (if available), year manufactured, flush volume, and the existence of displacement devices and infrared devices and the observance of notable leaks. In total, 757 toilets were sampled and further investigated. Of all the toilets tested, on only 33 percent was the age of toilet was discernable. It is suspected that older toilets were less likely to have markings of manufacturing dates on the toilets. Flush volumes of toilets were determined either with a T-5 flushmeter, through measured tank volumes, or by labeled flush volumes. Table C-8 of Appendix C shows tabulations of characteristics of measured toilets. The mean number of toilets per site were highest at hotels/motels and hospitals (this is based on total survey responses and not just the sampled toilets). Three separate types of toilets were sampled (see Table 14 for distribution of sampled toilets): gravity flush toilets (Q45), pressure-assisted toilets (Q46), and *other* types of toilets (Q47). The *other* types of toilets were primarily flush valves. In addition to separate tabulations of each of these toilet types, the end of Table C-8 provides summary statistics with the 3 toilet types combined (Q45+Q46+Q47).

TABLE 14
TYPES OF SAMPLED TOILETS

Toilet Type	Number of Sampled Toilets	Distribution	Mean Flush Volumes (gpf)
Gravity-Flush	414	54.7%	2.91
Pressure-Assisted	93	12.3%	1.84
Other	250	33.0%	2.57
TOTAL	**757**	**100.0%**	**2.67**

5.1.1 Gravity-Flush Toilets

Across all subsectors, 97 percent of gravity-flush toilets were floor-mounted and 56 percent of tested toilets were in private areas of the establishment. The most common make of gravity-flush toilets were by American Standard (49 percent). Where discernable, 56 percent of gravity flush toilets were manufactured in 1993 or later, with the highest percentage of newer toilets found in hospitals and semiconductor manufacturing facilities. Of the gravity flush toilets, the highest flow rates were found in grocery stores (4.1 gallons per flush [gpf]), food product manufacturing facilities (3.6 gpf),

and wholesale grocery facilities (3.6 gpf) and the lowest flow rates were found in semiconductor manufacturing facilities (2.4 gpf), as shown in Table 15. Overall 51 percent of measured toilets flushed at rates of 2 gpf or less. Notable leaks in the gravity flush toilets were only found in grocery stores (10 percent of sampled toilets). Very few toilet displacement devices were noted (1 percent of sampled toilets) and none were found that had infrared devices.

TABLE 15
GRAVITY-FLUSH TOILET AVERAGE FLUSH RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flush rate (gpf)	3.24	2.36	3.45	2.84	2.78	3.65	2.49	4.11	3.21	3.58	2.89	2.91
2 gpf or less	35%	67%	14%	51%	58%	35%	67%	40%	45%	28%	27%	51%

5.1.2 Pressure-Assisted Toilets

Across all subsectors, 79 percent of gravity-flush toilets were floor-mounted and 82 percent of tested toilets were in common areas of the establishment. The most common make of gravity-flush toilets were by Sloan (53 percent). Where discernable, 85 percent of pressure-assisted toilets were manufactured in 1993 or later, with several of the subsectors only having sampled toilets built since 1990. Overall, the mean flush rate of pressure-assisted toilets was 1.8 gpf, substantively less than that measured from gravity-flush toilets. The highest flush rates were found in wholesale grocery facilities (3.5 gpf) as shown in Table 16. No notable leaks were found in the pressure-assisted toilets. Very few toilet displacement devices were noted (5 percent of sampled toilets) and only 1 toilet was found that had an infrared device.

TABLE 16
PRESSURE-ASSISTED TOILET AVERAGE FLUSH RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flush rate (gpf)	1.73	1.60	1.60	1.60	NA	2.48	1.50	1.60	1.60	3.53	1.75	1.84
2 gpf or less	91%	100%	100%	100%	NA	60%	100%	100%	100%	50%	95%	91%

5.1.3 Other Types of Toilets

The *other* types of toilets were primarily flush valves. Flow rates for flush valve toilets were taken from the markings on the flush valve itself identifying the valves flow rate. In some instances flow rates were assumed, if no markings existed, based on the type and configuration of the valve, as well as the time required for flushing.

Across all subsectors, 54 percent of the flush valve toilets were wall-mounted and 78 percent of tested toilets were in common areas of the establishment. The most common make of toilet was by Sloan (45 percent). Forty-one percent of flush valve toilets where the manufactured date was noted were manufactured in 1993 or later (90 percent were manufactured since 1990). The average flush rate of these toilets, shown in Table 17, was 2.57 gpf . The highest flow rates were found in nursing care facilities (4.01 gpf) and the lowest flow rates were found in hospitals (1.50 gpf).[8] Overall, 10 percent of toilets were found having infrared devices. A few notable leaks in these toilets were

[8] The sample size of one toilet for the flush volume measurement in food product manufacturing was disregarded.

found in grocery stores (13 percent), office buildings (7 percent) and fabricated metal manufacturing facilities.

TABLE 17
OTHER TOILET AVERAGE FLUSH RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flush rate (gpf)	2.67	2.99	1.93	2.77	1.50	6.00	2.65	2.00	4.01	1.60	2.45	2.57
2 gpf or less	44%	61%	89%	33%	67%	0%	70%	75%	0%	100%	78%	62%

5.1.4 All Toilets

The end of Table C-8 of Appendix C provides a summation and tabulation of all sampled toilets and the measured characteristics. Across all subsectors, 77 percent of the toilets were floor-mounted and 59 percent of tested toilets were in common areas of the establishment. The most common makes of toilets were by American Standard (35 percent), Sloan (29 percent), and Kohler (16 percent). Of those sampled toilets with a discernable age (33 percent), 60 percent were manufactured in 1993 or later, with the highest percentage of newer toilets found in hospitals, semiconductor manufacturing facilities, and office buildings. The mean manufactured date of toilets was in 1993. Sixty percent of the sampled toilets flushed at rates of 2.0 gpf or less, 21 percent at rates from 2 to 4 gpf, and 20 percent at rates greater than 4 gpf. The highest flow rates were found (shown in Table 18) in food product manufacturing facilities (3.5 gpf), wholesale grocery facilities (3.3 gpf) and nursing care facilities (3.3 gpf). The lowest flow rates were found in schools (2.3 gpf) and semiconductor manufacturing facilities (2.4 gpf). Overall 60 percent of the toilets measured had flush rates of 2 gpf or less.

TABLE 18
ALL MEASURED TOILETS AVERAGE FLUSH RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flush rate (gpf)	2.53	2.43	2.66	2.74	2.64	3.52	2.50	2.43	3.27	3.31	2.32	2.67
2 gpf or less	55%	72%	52%	50%	59%	38%	68%	71%	40%	41%	76%	60%

Also shown on Table C-8 is a breakdown of flush volumes by age of toilet. Clearly, older toilets had greater flush rates, with flush rates of 5.1 gpf for toilets manufactured in 1979 or earlier, 3.83 gpf for toilets manufactured from 1980 to 1989, and 2.15 gpf for toilets manufactured in 1990 or later. However, a similar breakdown of toilet flush volumes by the age of building structure did not yield a clear trend, indicating that plumbing retrofits of older structures may have been performed.

Very few toilet displacement devices or toilets with infrared devices were noted. Notable leaks in toilets were also not very frequently reported, with only grocery stores indicating that 10 percent of sampled toilets had notable leaks.

5.2 Urinal Data

At each survey site, the field survey team was directed to sample about 10 percent of available urinals (up to a maximum of 10) and to identify selected characteristics of the sampled urinals

including flush volume, the existence of infrared devices and the observance of notable leaks. As shown in Table C-9 of Appendix C, the existence of urinals varied greatly among the subsectors. They were most commonly reported in office buildings (96 percent), schools (95 percent) and semiconductor/electronic manufacturing facilities (93 percent). Overall, the field survey team sampled 197 urinals. Of those sites that had urinals, the mean number of fixtures was 4.5 per site, with the greatest frequency reported at schools with an average of 14 urinals per site. Only two of the 225 surveyed establishments reported having waterless urinals (one grocery store had two waterless urinals, and one school had three).

Flush rates of urinals were determined either by the duration of flush, or by labeled flush volumes. Of the urinals tested, the highest mean flow rate was from the wholesale grocery facilities (1.7 gpf). Across all subsectors, the average flow rate of sampled urinals was 1.4 gpf, and 66 percent of all measured urinals were rated 1 gpf or less (see Table 19). However, these results may be skewed by the low number of tested urinals in selected subsectors.

TABLE 19
URINAL AVERAGE FLUSH RATES

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flush rate (gpf)	1.38	1.42	1.25	1.08	1.00*	1.58	1.09	1.35	1.00*	1.73	1.57	1.40
1 gpf or less	50%	78%	83%	85%	100%	63%	81%	75%	100%	62%	51%	66%

*Note: Measurements with samples less than 5.

5.3 Faucet Data

At each survey site, the field survey team was directed to sample about 10 percent of available faucets (up to a maximum of 10) and to identify selected characteristics of the sampled faucets including type/location of faucet, flow rates, the existence of aerators and infrared devices, and the observance of notable leaks. Table C-10 of Appendix C shows the tabulation of characteristics related to all types of reported faucets. Table 20 provides a summary of faucet fixture counts and sampled faucet flow rates (in gallons per minute, gpm), across all subsectors. Utility (3.63 gpm) and kitchen faucets (3.12 gpm) were generally found to flow at higher rates than restroom faucets (2.38 gpm).

TABLE 20
FAUCET COUNTS AND AVERAGE FLOW RATES

Faucet Type	Percent of Sites With Fixture	Mean Number of Faucets Per Site, If They Exist	Mean Flow Rate (gpm)
Restroom Faucets	100%	32.5	2.38
Kitchen Faucets	77%	3.8	3.12
Utility Faucets	41%	3.9	3.63
Maintenance Area Faucets	9%	1.5	3.09*
Laboratory Faucets	16%	6.0	3.09*
ALL TYPES			2.57

* Note: represents *other* types of faucets.

Kitchen faucets were most frequently reported in nursing care facilities (100 percent), hospitals (100 percent), and hotels/motels and schools (both at 91 percent). General cleaning faucets were most frequently reported in nursing care facilities (73 percent), fabricated metal manufacturing facilities (62 percent), and hospitals (60 percent). Laboratory faucets were most commonly reported in hospitals (60 percent) and physicians/dentists offices (55 percent).

Overall, the field survey team sampled 832 faucets. Of the faucets sampled, 75 percent were bathroom faucets, 16 percent were kitchen faucets, and 9 percent were other types of faucets. Flow rates of faucets (shown in Table 21) were determined using measured flow bags. Forty-one percent of the sampled faucets had flow rates of 2 gpm or less, 43 percent had rates of 2 to 3 gpm, 7 percent had rates of 3 to 4 gpm, and 10 percent had rates greater than 4 gpm. Overall, the mean flow rate from faucets was 2.57 gpm.

TABLE 21
FAUCET AVERAGE FLOW RATES (gpm)

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Restroom Faucets	2.27	2.31	2.89	3.24	2.46	2.28	2.15	2.20	2.43	2.65	1.93	2.38
Kitchen Faucets	2.34	2.46	2.16	2.17	6.23	3.71	3.23	4.35	3.51	2.52	2.45	3.12
Utility Faucets	1.75*	2.95*	6.00*	4.20	NA	4.00*	NA	4.90*	3.39	1.95*	3.00*	3.63
Other	NA	2.00*	3.52	2.23*	NA	NA	2.28*	NA	2.25*	NA	2.28	3.09
All Faucets	2.27	2.33	3.06	3.19	3.09	2.70	2.28	2.94	2.68	2.59	2.06	2.57
All faucets 2 gpm or less	48%	34%	26%	29%	44%	41%	48%	32%	34%	38%	58%	41%

*Note: Measurements with samples less than 5. NA: not available, no measurements taken.

Among the subsectors, the range of mean flow rates from the sampled faucets was fairly narrow. The highest flow rates from faucets were measured in the fabricated metal product manufacturing facilities (3.2 gpm), hospitals (3.1) and offices of physician/dentists (3.1). The lowest flow rates from faucets were measured in schools (2.1), office buildings (2.3) and hotels/motels (2.3). Similar to toilets, a breakdown of faucet flow rates by the age of building structure did not yield a clear trend.

A majority of faucets were found to have aerators attached ranging from 58 percent in hospitals to 97 percent in hotels/motels, with 79 percent of all sampled faucets having an aerator attached. Infrared devices on faucets were most commonly reported in the fabricated metal product manufacturing subsector (11 percent). Notable faucet leaks were most frequently reported in hospitals (6 percent).

5.4 Shower Data

At each survey site, the field survey team was directed to sample about 10 percent of available showers (up to a maximum of 10) and to identify selected characteristics of the sampled showers including type of showerhead, flow rates, the existence of a shut-off button, and the observance of notable leaks. Table C-11 of Appendix C shows the detailed tabulation of shower characteristics.

Overall, 37 percent of survey establishments reported having showers on-site, with a mean of 61 showers per site. The median number of showers per site was 7, which indicates that the mean was skewed higher due to the large number of showers in hotels/motels, hospitals, and schools.

As expected, the variability of the existence of showers is high with 100 percent of hospitals, hotels/motels and nursing care facilities reporting their existence and on the low end only 5 percent of grocery stores reporting the existence of showers.

Overall, the field survey team sampled 203 showers. Average flow rates for showerheads shown in Table 22 ranged from 1.7 gpm at office buildings to 3.0 gpm at hotels/motels. Twenty-one percent of

measured showers flowed at rates of 2 gpm or less. Again, a breakdown of shower flow rates by the age of building structure did not yield a clear trend.

TABLE 22
SHOWER AVERAGE FLOW RATES (gpm)

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Flow rate (gpm)	1.72	2.74	2.50*	1.76	2.38	NA	3.01	NA	2.61	NA	2.92	2.76
2 gpm or less	67%	40%	0%	73%	52%	NA	5%	NA	26%	NA	33%	21%

*Note: Measurements with samples less than 5. NA: not available, no measurements taken.

Across all subsectors, 51 percent of sampled showers were stream/spray types, while 43 percent were atomizing, though this distribution varied substantially among the subsectors. Similarly, 72 percent of showerheads were fixed and 27 percent were handheld, but again this distribution varied substantially among the subsectors. Thirty percent of sampled showers had a showerhead shut-off button, and only 5 percent of showers had any notable leak. Hotels/motels had the highest observed percentage of showerhead shut-off buttons (40 percent) and also were the only subsector with notable leaks on the showerheads (9 percent).

5.5 Dishwasher Data

At each survey site, the field survey team was directed to obtain characteristics of dishwashers on site including whether brand had the Energy Star label, the manufacturer/make/model number, the dishwasher type, the rinse type, and note the existence of an incoming pressure regulator.[9] Table C-12 shows the detailed tabulation of dishwasher characteristics. Across all subsectors, dishwashers were reported at 37 percent of the surveyed sites, with an average number of 1.8 dishwashers per site, if they existed. The existence of dishwashers ranged from none at grocery stores to 100 percent at hospitals. The average number of dishwashers per site varied from 1.0 per site at offices of physicians/dentists, hospitals, food product manufacturers, and wholesale grocery facilities to 2.9 per site at nursing care facilities.

Across all subsectors, 77 dishwashers were further investigated for specific characteristics. Overall, 16 percent of investigated dishwashers were clearly marked with the Energy Star label, and this varied substantially across subsectors. Sixty different makes/models were noted during the on-site surveys. Only 5 of these 60 makes/models are listed as Energy Star-qualified dishwashers (or 5 of the 77 sampled dishwashers). As noted previously, the EPA Energy Star program provides listings of energy-efficient dishwashers; however, they have not focused on water efficiency as a qualifying factor. Furthermore, the Energy Star listings appear to focus on residential-types of dishwashers rather than high capacity dishwashers that may be used in commercial settings.

[9] After completion of the initial site surveys and initial reporting of manufacturer data of dishwashers, the District indicated that it would like to have more specific detail on the make and model number of existing dishwashers in order to determine whether the dishwashers met current high efficiency standards. Therefore, all surveyed establishments with dishwashers were resurveyed to confirm the appliance model number. The site visits to resurvey these appliances were not pre-scheduled with the establishment; the surveyor appeared at the establishment and requested to look at the appropriate facilities as a follow up to the previous water use survey. In almost all cases staff was available and willing to allow the surveyor to examine the dishwashers. In the majority of the cases the surveyor was able to obtain the desired information; in some cases the model number was not accessible due to the specifics of the installation, i.e. the machine backed up against a wall or mounted on an elevated platform.

Across all subsectors, 74 percent of the investigated dishwashers had a stationary rack, while 22 percent were the commercial-type conveyor dishwashers. Fifty-six percent of the investigated dishwashers used a water rinse, and 42 percent used a chemical rinse. Overall, 25 percent of the dishwashers had an incoming pressure regulator. These characteristics varied substantively across the subsectors.

5.6 Clothes Washer Data

At each survey site, the field survey team was directed to obtain characteristics of clothes washers on site including the manufacturer/make/model number, the clothes washer type, the capacity, the number of cycles, and the existence of a water saving/load size selection feature.[10] Table C-13 shows the detailed tabulation of clothes washer characteristics. Many of the subsectors reported having no laundry facilities or clothes washers including office buildings, semiconductor/electronic manufacturing facilities, and wholesale grocery facilities. On the high end, 100 percent of nursing care facilities, 86 percent of hotels/motels and 80 percent of hospitals reported having laundry facilities or clothes washers. The average number of clothes washers per site varied from 1.0 per site at offices of physicians/dentists and food product manufacturers to 2.7 per site at nursing care facilities.

Across all subsectors, 85 clothes washers were further investigated for specific characteristics. Fifty-four different makes/models were noted during the investigation. Seventy-five percent of all investigated clothes washers were front-loading, and 25 percent were top-loading. For those clothes washers where measurements could be obtained, the average capacity of the clothes washers were 56 pounds of material and 5.1 cycles per load. Thirty-nine percent of investigated clothes washers had water-saving/load size selection feature. These characteristics varied substantively among the subsectors, but with the exception of hotels/motels and nursing care facilities, the number of investigated clothes washers per subsector was small.

5.7 Garbage Disposal Data

At each survey site, the field survey team was directed to obtain characteristics of garbage disposals on site including the manufacturer/make/model number and the disposal type.

Table C-14 shows the tabulation of characteristics of the investigated garbage disposals. Overall, 33 percent of surveyed establishments had a garbage disposal, ranging from 5 percent at grocery stores to 87 percent at nursing care facilities. The mean number of disposals per site range from 1.0 to 6.1 disposals per site, with an average of 3.0 disposals per site where they existed.

[10] As mentioned in the dishwasher discussion, after completion of the initial site surveys and initial reporting of manufacturer data of dishwashers, the District indicated that it would like to have more specific detail on the make and model number of existing clothes washers in order to determine whether the clothes washers met current high efficiency standards. Therefore, all surveyed establishments with clothes washers were resurveyed to confirm the appliance model number. The site visits to resurvey these appliances were not pre-scheduled with the establishment; the surveyor appeared at the establishment and requested to look at the appropriate facilities as a follow up to the previous water use survey. In almost all cases staff was available and willing to allow the surveyor to examine the clothes washers. In the majority of the cases the surveyor was able to obtain the desired information; in some cases the model number was not accessible due to the specifics of the installation, i.e. the machine backed up against a wall or mounted on an elevated platform.

Across all subsectors, 61 garbage disposals were further investigated for specific characteristics. The most common make of garbage disposals was by In Sink Erator (46 percent). Ninety-two percent of all investigated disposals were regular garbage disposals rather than the scrapper or conveyor types.

5.8 Other Water Features Data

As part of the site surveys, the field team also investigated specific characteristics of swimming pools, spas, and fountains. As shown in Table C-15, only hotels/motels (77 percent) and schools (23 percent) reported the existence of swimming pools. Overall, 2 indoor pools and 13 outdoor pools in the hotel/motel subsector were investigated, and 3 outdoor pools in the school subsector were investigated. The investigated indoor swimming pools averaged about 2,700 cubic feet, and outdoor swimming pools averaged about 3,900 cubic feet. None of the indoor swimming pools reported using a pool cover, and only 19 percent of outdoor pools reported using a pool cover. However, in this case, pool covers were used by all 3 outdoor pools in the schools subsector, and by none of the 13 outdoor pools in the hotel/motel subsector. No notable leaks were reported in/around the swimming pools.

Table C-16 show that spas/Jacuzzis were only reported at nursing care facilities (7 percent), hospitals (20 percent) and hotels (73 percent). Hotels/motels reported an average number of 2.81 spas per site (at sites that had them). Overall, 3 indoor spas and 13 outdoor spas in the hotel/motel subsector, and 1 indoor spa in the nursing care facility were investigated. The investigated indoor spas averaged about 100 cubic feet, and outdoor spas averaged about 300 cubic feet. None of the indoor spas reported using a cover, and only 13 percent of outdoor spas reported using a cover. No notable leaks were reported in/around the spas.

As shown in Table C-17, fountains were reported at office buildings (8 percent), schools (9 percent), nursing care facilities (13 percent), hotels/motels (18 percent) and hospitals (20 percent). Sixteen fountains were investigated during the on-site surveys. However, of the 10 fountains in the hotel/motel subsector, specific measurements were obtained at only one. One of the two fountains in the nursing care facilities had a reported leak. The largest fountains were noted in the office building subsector. On average, the capacities of the fountains were about 300 cubic feet. Fifteen of the 16 investigated fountains reported having a recirculating system (the remaining one was noted as *don't know*).

Section 6
Outdoor Facility and Irrigation System Characteristics

Outdoor water use, not only of the residential sector but also of the CII sector, can be a significant component of total water demand. For this reason, increases in the efficiency of outdoor water use can be a target for water conservation program efforts. Upon completion of the indoor on-site survey component, the field survey team sought to obtain information on the outdoor areas of the facility and the irrigation systems. Tables C-18, C-19 and C-20 of Appendix C provide reported and measured outdoor facility and water use characteristics.

Outdoor surveys were attempted at all survey sites. It should be noted, however, that in a substantive number of cases, full outdoor surveys were not completed for a variety of reasons including: lack of access, landscape contractor not available, no landscaping, no escorts/landlord not available, shared facilities, no irrigation systems, landscapers working on property, landscaping not managed by the facility, or rainfall on the date of the survey. The primary difficulty was obtaining any information on the irrigation systems and performing catch can tests. Measurements of lot sizes and percent landscape was information sought and collected for many of the surveys conducted. In many cases an establishment was a single tenant in a much larger complex, and determining the amount of landscaping attributable to a specific establishment would not be meaningful. Single tenants in larger building complexes were especially prevalent in the semiconductor manufacturing, fabricated metal product manufacturing, offices of physicians and dentists, and grocery store subsectors. Grocery stores and wholesale grocery subsectors often had no landscaping at all. In some cases, the lot extents and/or landscapable area was not accessible without an escort. If the contact was not willing to escort the surveyor around the property in these cases due to time constraints, this portion of the survey was not completed.

6.1 Outdoor Facility Characteristics

As shown in Table C-18 of Appendix C (and summarized in Table 23), for those surveyed establishments where lot sizes could be determined, the average lot size was approximately 133,000 square feet, ranging from 34,000 square feet in food product manufacturing facilities to 314,000 square feet at schools. On average, landscapable areas represented about 12 percent of the total lot area and irrigated landscape represented 10 percent of the total lot area (calculated, not reported, ratios). Among the subsectors, the percentage of landscapable areas relative to total lot area ranged from little or none (food product manufacturing, grocery stores, and wholesale grocery facilities) to about 26 percent (schools). As shown by the *maximum* values of this calculation in Table C-18, there were a few establishments that had a large percent of the lot as landscape areas (schools, office buildings).

On average at those sites where outdoor measurements were undertaken, 42 percent of the landscapable area was devoted to turf and 49 percent of the *irrigated* landscape was devoted to turf (calculated, not reported, ratios). Again, among the subsectors, these characteristics varied greatly, with higher percentages of turf relative to the landscaped area reported from schools (64 percent) and office buildings (82 percent).

TABLE 23
OUTDOOR FACILITY CHARACTERISTICS

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Fab. Metal Mfg.	Hospitals	Food Product Mfg.	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools	ALL SUB-SECTORS
Average lot size (1,000 sq. feet)	98	98	73	61	NA	34	156	41	98	57	314	133
Percent of landscape area/total lot area	16%	13%	15%	8%	NA	0%	8%	1%	10%	3%	26%	12%
Percent of irrigated landscape area/total lot area	16%	13%	13%	7%	NA	0%	8%	1%	7%	3%	18%	10%
Percent of turf area/ landscapable area	82%	39%	33%	59%	NA	0%	22%	15%	38%	14%	64%	42%
Percent of turf area/irrigated area	82%	44%	42%	71%	NA	0%	23%	15%	39%	15%	97%	49%

NA = Not available

6.2 Irrigation System Characteristics

Where irrigation systems could be investigated, it was found that many establishments have multiple types of irrigation systems at a given site. Most frequently reported at those establishments where water was used for landscaping purposes and where measurements were taken were automatic in-ground systems (88 percent), automatic drip systems (48 percent), and manual in-ground systems (23 percent).

At those sites where water was used for landscaping purposes and where the field survey team had access to the irrigation equipment, additional investigations were performed on the automatic irrigation system. The results are shown in Table 24 and Table 25 (more detailed statistics are show in Table C-19 of Appendix C). The surveyors were able to investigate irrigation systems at 59 of the survey sites, though because of accessibility issues, not all desired irrigation system measurements were obtained. On average, automatic irrigation systems had 2.2 controllers and these controllers were adjusted on average 3.7 times per year.

A total of 69 controllers were sampled across all subsectors. The most common brand of controllers was Rainbird (35 percent) and Irritrol (33 percent). Eighty-one percent of the controllers were digital and 12 percent were mechanical. The average number of stations per automatic system was 13 and the average number of zones was 8. Also, it was found that given irrigation systems often have multiple sprinkler types (therefore the sum of types will be more than 100 percent). The most frequently noted sprinkler types were pop-up heads (84 percent) and drip systems (54 percent). The most frequently reported type of calendar clock on the controller was a 14-day system (49 percent).

During the on-site surveys, the field team undertook tests of the irrigations system that measured the dispersion of water.

TABLE 24
TYPES OF IRRIGATION SYSTEMS

	Percent *Yes* Responses
Automatic in-ground	88%
Manual in-ground	23%
Automatic drip	48%
Manual drip	13%
Hose only	8%
Hose & sprinkler	6%
Hose & sprinkler, with timer	9%

Note: Multiple irrigation system types were reported at individual facilities, therefore, sum will not add to 100%.

The measurements were facilitated by the distribution of water collection cans (tuna fish sized cans) and the measurement of water in the collection cans from the irrigation system. The results are provided in the following section.

TABLE 25
AUTOMATIC IRRIGATION SYSTEM CHARACERTICS

Mean number of irrigation system controllers per site	2.2 (59)
Mean number of times controllers are adjusted annually	3.7 (48)
Mean number of controllers per 1,000 square feet of irrigated area	0.57 (41)
Mean number of stations per irrigation system	13 (41)
Mean number of stations per 1,000 square feet of irrigated area	1.66 (17)
Mean number of zones per irrigation system	8 (31)
Mean number of zones per 1,000 square feet of irrigated area	1.55 (14)

Note: Based upon surveys for which irrigation system characteristics were measured. Numbers in parentheses represent the total sample size, across all sectors, for which the value was calculated. A missing value in either of the parameters eliminated a record from calculation.

6.2.1 Precipitation Rate

The precipitation rate measures the amount of water a sprinkler system delivers to an area and is typically measured in inches per hour. As a means of estimating precipitation rates for the surveyed sample of establishments, catch-can tests were performed at several willing establishments. The catch-can test involved placing several cans of equal diameter and height around a sprinkler head and running the sprinkler system for a measured amount of time (generally 10 to 15 minutes). Water collected in each can was then measured in inches from the base of the can. The precipitation rate at each establishment was calculated by dividing the average measure of water per can from all cans used at that establishment by the runtime at the establishment. The resultant value represented the precipitation rate in inches per minute. Since precipitation rates are generally measured in inches per hour, per minute values were multiplied by 60 to convert them to inches per hour.

Table 26 summarizes precipitation rate results from establishments in each water-using sector. The number of establishments for which catch-can tests were performed ranged from 1 (in the semiconductor manufacturing; office of physicians and dentists; hospitals and grocery stores sectors) to 9 in the nursing care facilities sector (see Table C-20 of Appendix C). Because of the difficulties in completing the outdoor component of the survey (referenced earlier), these are very low sample sizes and the results should not be viewed as definitive conclusions. Higher average precipitation rates by subsector were observed in the offices of physicians and dentists (4.49 inches/hour), hotel/motels (4.32 inches/hour) and wholesale grocery and related product sectors (3.12 inches/hour). Lower sector average precipitation rates were observed in the grocery stores (0.8 inches/hour), hospitals (1.13 inches/hour) and semiconductor manufacturing sectors (1.69 inches/hour). For comparison purposes, the *Santa Clara County Residential Water Use Baseline Study* estimated average precipitation rates of 1.4 and 1.5 inches per hour for irrigation systems at single-family and multifamily residences. According to the residential study, a precipitation rate of less than 1 is generally considered low, while that ranging from 1 to 2 is considered moderate. A precipitation rate that is greater than 2 is generally considered high. Approximately 16 percent of single-family and 17 percent of multi-family systems tested had precipitation rate values exceeding 2.0.

TABLE 26
PRECIPITATION RATES (PR)

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Hospitals	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools
Average PR (in/hr)	2.97	1.69	4.49	1.13	4.32	0.8	1.94	3.12	2.12
Sample size	2	1	1	1	8	1	9	2	6
PR range	Percent of surveyed establishments with a PR in the range shown								
0.0 - 0.5							11%		50%
0.5 - 1.0	50%					100%	11%		
1.0 - 1.5				100%			22%		
1.5 - 2.0		100%					22%		
2.0 - 2.5							11%	50%	
2.5 - 3.0					25%				
More than 3.0	50%		100%		75%		22%	50%	50%

6.2.2 Distribution Uniformity

To measure the performance of irrigation systems at surveyed establishments, distribution uniformity estimates were calculated. The distribution uniformity measures how evenly water is applied by an irrigation system. Distribution uniformity values for establishments in this study were calculated as the ratio of average measure of water per can in the lower quartile of cans at an establishment divided by the overall average measure of water per can from all cans used at that establishment. Table 27 summarizes distribution uniformity findings at establishments for which a catch-can test was performed. Looking at the different sectors, distribution uniformity average by sector was higher for hotel/motel (0.76), office buildings (0.65) and wholesale grocery and related products sectors (0.62). The distribution uniformity average was lower for grocery stores (0.29), semiconductor manufacturing (0.31) and the hospitals sector (0.35).

The distribution uniformity measure is affected by the type of irrigation system used at an establishment. According to the *Santa Clara County Residential Water Use Baseline Study*, an estimate of 0.65 to 0.7 represented a well-designed system using modern equipment and primarily using pop-up spray sprinkler heads. Distribution uniformity average for irrigation systems at single-family and multi-family residences in that study was 0.46 and 0.45 respectively.

TABLE 27
DISTRIBUTION UNIFORMITY (DU)

	Office Buildings	Semicon-ductor Mfg.	Physicians/ Dentists	Hospitals	Hotels/ Motels	Grocery Stores	Nursing Care Facil.	Wholesale Grocery Facil.	Schools
Average DU	0.65	0.31	0.53	0.35	0.76	0.29	0.48	0.62	0.59
Sample size	2	1	1	1	8	1	9	2	6
DU Range	**Percent of surveyed establishments with a DU in the range shown**								
0.0 - 0.1							22%		33%
0.2 - 0.3						100%			
0.3 - 0.4		100%		100%			11%		
0.4 - 0.5							22%		
0.5 - 0.6	50%		100%				11%	50%	
0.6 - 0.7					13%		11%	50%	
0.7 - 0.8	50%				50%				
0.8 - 0.9					38%		11%		50%
0.9 - 1.0							11%		17%

Section 7
Water Use Characteristics

In addition to conducting the on-site surveys and evaluating the survey results, the Baseline Study sought to obtain and analyze the water use characteristics of the survey participants. This activity was performed in cooperation with the District and their retail water providers. This section addresses:

- The water use data collection and database development process,
- The descriptive statistics of water use characteristics in the 11 subsectors,
- A comparison of water use of the survey participants with that of other published studies,
- An analysis of the collected historical water use data for survey participants in conjunction with the survey data and other explanatory variables in order to establish statistically-based models that can be used to explain variations in water use in the different water use subsectors.

7.1 Water Use Data Collection

Historical water use records for individual establishments are best acquired directly from utility water providers. As part of the on-site surveys, participants were asked to sign a form that provided customer consent to release water billing records. These consent forms were provided to the District and the District sought to collect the water billing records for each of the surveyed establishments from the respective retail water providers.

In the case of the District service area, customers purchase their water service from 13 retail water providers. To determine which water retailer provides service to an establishment, the survey questionnaire included questions requesting the name of their water service provider and any associated account number information. However, only about half the surveyed establishments readily provided water retailer and account number information. Additionally, in the cases where such information was provided, it was difficult to ascertain the completeness and accuracy of the account number information provided. There was also the expected high probability that customers could inadvertently confuse one water retail provider for another.

As a result, rather than rely on account information obtained from survey participants, the District provided the retail water providers with the name and address of each surveyed establishment and asked to match the surveyed establishment with water account information on their billing system. Retail water providers had the option of simply using the establishment's name as the matching criteria or in other cases use the service address as the matching criteria. Retail water providers were asked to provide the most recent 13 months of meter reading and consumption data for those accounts that are billed monthly, or the most recent 7 meter reading and consumption data for those accounts that are billed every two months.

It was anticipated that some surveyed establishments may not have a unique match to a water billing account due to the fact that there may be multiple establishments associated with one service account. This is typically the case for establishments that are part of a larger office building or strip

mall. In such cases, it would not be possible to get a match between a surveyed establishment and a unique water use record if the office building or strip mall is not individually metered for each unit. For some surveyed establishments, the retail water provider may have multiple accounts or multiple meters for a given establishment (e.g., a hospital may have more than one account or more than one meter). In such cases, retail water providers were asked to provide all accounts or meters for the given establishment.

7.2 Water Use Database Creation

Upon receipt of all available historical water use records from the retail water providers and the District, the data was compiled into a database for analysis. Water use records for 174 of the 225 surveyed establishments were obtained from the retail water providers. The water use records generally represented the time period from mid-2003 to mid-2004. At least 66 of these establishments had multiple meters ranging from 2 to 10 meters. Table 28 presents the distribution of the establishments by number of meters. Meters were typically classified based on categories of water use including: indoor, outdoor, irrigation only, recycled irrigation only and mixed purposes.

Historical water use records obtained from the retail water providers included information such as: the name of the retail water provider, the customer account number from the utility billing system, the customer account name from the utility billing system, the service address from the utility billing system, the meter number, consumption units, meter-read date and the measured consumption. The last three fields listed were the most useful for the analysis since they provided adequate information to calculate water consumption per billing cycle.

TABLE 28
DISTRIBUTION OF ESTABLISHMENTS WITH WATER RECORDS BY NUMBER OF METERS

Number of Meters at Establishment	Number of Establishments	Percent of Total Establishments With Water Records
1	108	62.1%
2	44	25.3%
3	13	7.5%
4	5	2.9%
5	1	0.6%
6	2	1.1%
10	1	0.6%
Total	**174**	**100.0%**

Prior to proceeding with such calculations, the data had to be processed and cleansed of any errors and inconsistencies. Not only did the historical water use data have a varying number of meters per surveyed establishment, the historical water use data also had divergent meter reading dates and a few variations in water use units. In order to be able to effectively use the data, the provided water consumption readings from the varied retail providers had to be converted into consistent units of measure (gallons). The initial step in this process required the chronological ordering of billing records of each establishment by meter-reading date. The recorded water consumption values were then summed by meter-reading date per establishment. This procedure produced a single water consumption estimate for each meter-reading period for a given establishment.

The number of days between each chronologically sorted meter-reading date for each establishment (for which water use data was obtained) was assumed to be the number of days in the billing cycle. This number varied within each establishment and across establishments. Therefore, to permit an accurate comparison of water consumption from one billing period to the next and across

establishments, total water consumption per billing period was divided by the number of days in that billing period. The resulting measure was considered the average daily water use per billing period for that establishment.

For each billing period, there was a distinct beginning and end date of the meter reading at given establishments. These dates were used to match up with a distinct set of weather characteristics that occurred during that water consumption time period. Weather data for the study area was obtained from the California Irrigation Management Information System (CIMIS). Daily weather data that were matched up with water consumption values in distinct time periods included maximum daily air temperature and total daily rainfall. Because there were distinct beginning and end dates for each meter reading, it was possible to calculate average maximum daily temperatures and total precipitation for each billing cycle by establishment. Matching billing cycles to weather conditions that occurred in that billing cycle period enables the evaluation of variations in water use in relation to variations in weather.

Therefore, for each surveyed establishment, the database was comprised of:

- Facility characteristics, as measured during the on-site surveys,
- Water use data for a one-year period, comprised of 6 billing periods if a bimonthly billing cycle or 12 billing periods if a monthly billing cycle, and
- Daily weather data that corresponded to the water consumption time period between meter-read dates.

7.3 Overview of Historical Water Use by Subsector

This section presents a summary of the water use characteristics for those surveyed establishments for which water consumption data was obtained. Figure 1 reveals the general variation in average daily water use by subsector sample. Based on the surveyed sample, Figure 1 shows that the hospital, the semiconductor manufacturer and the hotel/motel subsectors respectively had the highest, second highest and third highest average daily water use per billing period with approximately 27,913; 24,087; and 18,843 gallons per establishment per day (gpd). Intuitively, this is reasonable considering the typical sizes of such facilities as hospitals and hotels/motels. Nursing care facilities ranked higher (fourth with 16,027 gpd) than food product manufacturers (fifth with 12,001 gpd) and elementary/secondary school facilities (sixth with 9,342 gpd).

More detailed statistics regarding the estimated average daily water use for the 11 subsectors considered in this study are provided in Table 29. The statistical measures presented in Table 29 include the minimum, maximum, mean, median, standard deviation, and percentiles for water use characteristics in each subsector. The following provide definitions of each of these parameters:

- Minimum. The minimum value obtained from a given establishment
- Maximum. The maximum value obtain from a given establishment
- Mean. The arithmetic average of all measured values

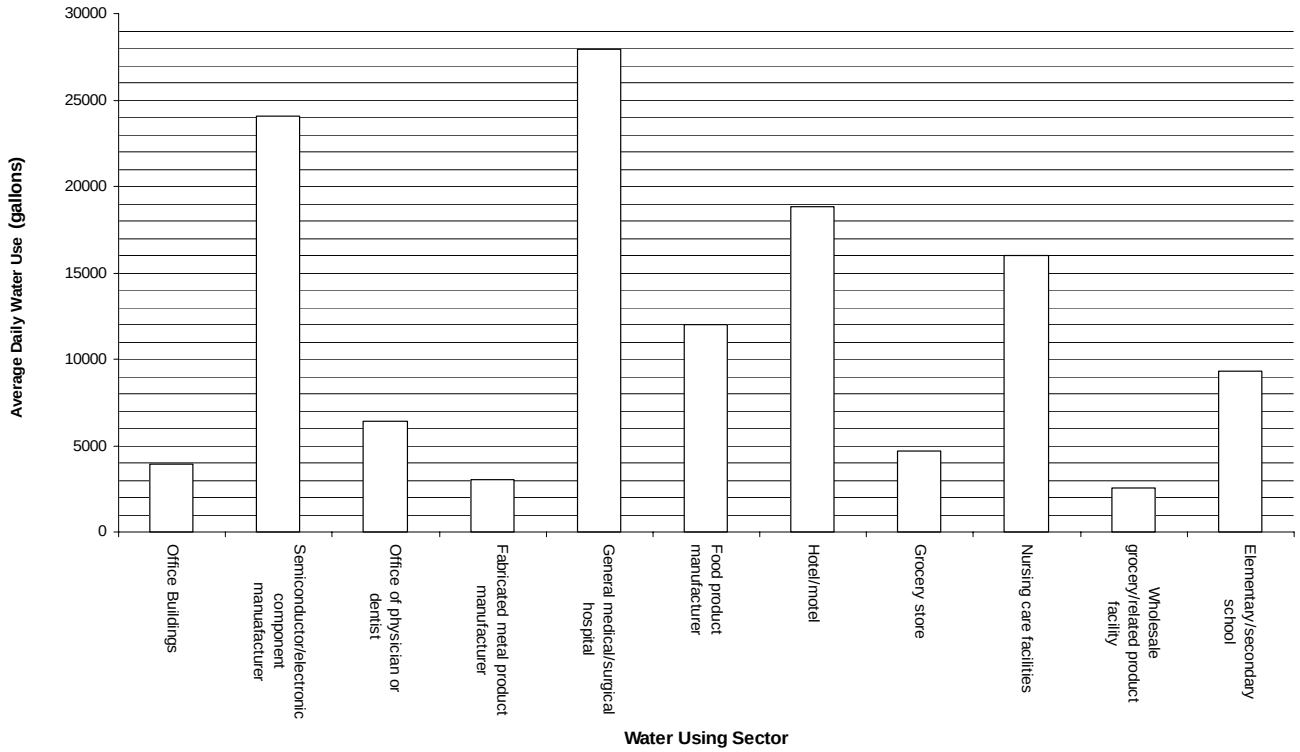

FIGURE 1
VARIATIONS IN AVERAGE DAILY WATER USE PER BILLING CYCLE BY SUBSECTOR

- Median. Represents the point in the data set (in ascending order) that has half of the frequencies of response above it and half of the frequencies of response below it.

- Standard Deviation. A measurement of the dispersion about the mean

- Percentiles. Represents the values, when in ascending order, where certain percentages of the measurements fall (e.g., at the 25 percent level of all measurements, the 50 percent level, and the 75 percent level)

- Coefficient of Variation. Standardized value that shows relative variability, calculated by standard deviation divided by the mean.

TABLE 29
WATER USE CHARACTERISTICS

CII Subsector	Number of Survey Sites with Water Use Data	Water Use Characteristic	Measurement Unit	Number of Water Use Data Points	Minimum	Maximum	Mean	Median	Standard Deviation	Percentiles			Coefficient of Variation
										25%	50%	75%	(std/mean)
Office Buildings	14	Average daily water use per day	gpd	129	67	13,995	3,918	2,401	3,790	456	2,401	6,941	0.97
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	112	4	1,752	147	53	298	28	53	137	2.02
		Average daily water use per employee	g/e/d	117	1	357	29	13	54	6	13	30	1.85
Semiconductor/Electronic Component Manufacturers	18	Average daily water use per day	gpd	178	52	264,463	24,087	2,887	62,203	1,107	2,887	6,680	2.58
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	154	5	4,808	597	123	1,232	46	123	279	2.06
		Average daily water use per employee	g/e/d	178	2	1,775	163	68	278	23	68	210	1.71
Offices of Physicians or Dentists	14	Average daily water use per day	gpd	124	45	46,354	6,435	3,568	9,247	535	3,568	7,630	1.44
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	112	1	8,014	902	329	1,468	40	329	1,123	1.63
		Average daily water use per employee	g/e/d	124	0	2,404	362	138	464	38	138	610	1.28
		Average daily water use per patient visit	g/visit/d	99	0	2,399	273	52	524	24	52	146	1.92
Fabricated Metal Product Manufacturers	16	Average daily water use per day	gpd	170	22	19,545	3,011	1,174	4,863	202	1,174	2,566	1.62
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	170	2	1,303	175	54	302	21	54	221	1.72
		Average daily water use per employee	g/e/d	170	2	652	118	50	164	18	50	112	7.00
General Medical/Surgical Hospitals	5	Average daily water use per day	gpd	53	217	120,301	27,913	8,684	36,772	2,072	8,684	32,732	1.32
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	47	1	378	187	218	121	2	218	279	0.65
		Average daily water use per employee	g/e/d	53	0	80	42	47	26	28	47	63	0.61
		Average daily water use per hospital bed	g/bed/d	53	1	408	163	133	133	32	133	274	0.82
Food Product Manufacturers	16	Average daily water use per day	gpd	180	45	82,519	12,001	2,958	19,091	681	2,958	10,633	1.59
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	169	6	8,252	795	359	1,686	123	359	555	2.12
		Average daily water use per employee	g/e/d	180	9	1,477	235	126	285	72	126	283	1.21
Hotels/Motels	20	Average daily water use per day	gpd	221	673	106,620	18,843	10,577	22,525	3,531	10,577	28,469	1.20
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	90	17	546	173	175	116	77	175	219	0.67
		Average daily water use per employee	g/e/d	221	9	1,133	321	287	221	153	287	422	0.69
		Average daily water use per hotel bed	g/bed/d	221	8	227	65	55	41	38	55	81	0.63
Grocery Stores	19	Average daily water use per day	gpd	199	15	28,177	4,690	2,820	4,680	1,773	2,820	6,051	1.00
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	187	0	2,540	322	101	527	66	101	215	1.64
		Average daily water use per employee	g/e/d	199	0	1,165	128	69	190	42	69	113	1.48
Nursing Care Facilities	12	Average daily water use per day	gpd	130	6,889	54,769	16,027	14,115	9,111	10,120	14,115	17,900	0.57
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	96	97	3,748	1,009	557	942	349	557	1,310	0.93
		Average daily water use per employee	g/e/d	130	34	722	190	134	136	101	134	250	0.71
		Average daily water use per in-patient visit	g/visit/d	22	126	630	341	297	206	129	297	532	0.60
Wholesale Grocery Product Facilities	15	Average daily water use per day	gpd	172	7	17,256	2,538	494	4,624	157	494	2,068	1.82
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	137	1	1,726	202	36	436	13	36	129	2.15
		Average daily water use per employee	g/e/d	172	1	2,465	198	39	567	17	39	78	2.86
Elementary/Secondary Schools	18	Average daily water use per day	gpd	177	127	109,021	9,342	4,084	14,683	1,735	4,084	9,746	1.57
		Average daily water use per 1,000 sq. ft.	g/K sq. ft./d	46	1	740	81	45	153	20	45	70	1.88
		Average daily water use per employee	g/e/d	177	1	1,314	120	61	166	30	61	141	1.39
		Average daily water use per student	g/student/d	153	0	151	15	8	21	4	8	15	1.37

TABLE 30
AVERAGE DAILY WATER USE PER EMPLOYEE (GED) COMPARED TO RESULTS FROM OTHER STUDIES

	SCVWD Baseline Sample				AWWARF CI Study				MWDSC Study				IWR-MAIN Water Use Coefficents			
Water Use Subsector	**n**	**Min**	**Max**	**Mean**	**n**	**Min**	**Max**	**Mean**	**n**	**Min**	**Max**	**Mean**	**n**	**Min**	**Max**	**Mean**
Office Buildings	14	1	357	29	67	4	3,636	137	267	--	--	43*	--	--	--	--
Semiconductor Mfg.	18	2	1,775	163	--	--	--	--	187	4	7,432	333	224	--	--	169
Offices of Physicians	14	1	2,404	362	--	--	--	--	33	19	5,633	1,287	56	--	--	203
Offices of Dentists	14	0	2,404	362	--	--	--	--	9	65	362	175	22	--	--	259
Fabricated Metal Product Mfg.	16	2	652	118	--	--	--	--	255	4	6,733	304	393	--	--	154
General Medical/Surgical Hospitals	5	1	80	42	--	--	--	--	46	5	249	76	122	--	--	75
Food Product Mfg.	16	9	1,477	235	--	--	--	--	134	6	4,629	516	252	--	--	469
Hotels/Motels	20	9	1,133	321	88	83	3,491	668	69	55	5,082	926	197	--	--	230
Grocery Stores	19	0	1,165	128	33	51	490	175	21	15	4,285	352	69	--	--	94
Nursing Care Facilities	12	34	722	190	--	--	--	--	28	29	4,090	412	106	--	--	197
Wholesale Grocery Product Facilities	15	1	2,465	198	--	--	--	--	12	4	655	198	76	--	--	103
Elementary/Secondary Schools	18	1	1,314	120	138	30	971	341	159	9	12,792	623	207	--	--	169

Notes: n = sample size, GED = gallons per employee per day; * office buildings in the MWDSC Study was a combination of establishments defined as "miscellaneous commercial."

Sources:

AWWARF CI Study: Dziegielewski, B., J. Kiefer, E. Opitz, G. Porter, G. Lantz, W. DeOreo, P. Mayer, J. Nelson. 2000. Commercial and Institutional End Uses of Water. Denver, CO: American Water Works Association Research Foundation.

MWDSC Study: Dziegielewski, B. D. Rodrigo, E. Opitz. 1990. Commercian and Industrial Water Use in Southern California. Los Angeles, CA: Metropolitan Water District of Southern California.

IWR-MAIN Water Use Coefficients: Planning and Management Consultants, Ltd. 1994. IWR-MAIN Water Demand Analysis Software: User's Manual and System Description. Carbondale, IL.

A

For comparative purposes, average water use obtained for the sampled establishments in the District was viewed in comparison with results from three additional studies:

1. A report published by the American Water Works Research Foundation (AWWARF), *Commercial and Institutional End Uses of Water (*the AWWARF CI Study).[11] Subsectors included in that study included office buildings, hotels/motels, supermarkets and schools. The water use data in the AWWARF CI Study represented customers from the Metropolitan Water District of Southern California, City of Phoenix Water Services Department, Southwest Florida Water Management District, and the City of Denver.

2. A study conducted for the Metropolitan Water District of Southern California, entitled *Commercial and Industrial Water Use in Southern California* (the MWDSC Study),[12] which included a survey and study of nonresidential customers in the Metropolitan Water District of Southern California service area.

3. Per employee water use coefficients from the IWR-MAIN Water Demand Analysis Software which was based on a sample of nonresidential establishments across the U.S.[13]

Table 30 provides a comparison of average daily water use per employee for the water use subsectors where comparable data was found. Standardizing average daily water use into average water use per employee provides a mechanism to try to account for establishments of various sizes. However, as will be shown in the following sections, even with the standardization of average water use per establishment to a measurement of average water use per employee, the range of observed values can still be quite large. The following sections discuss the water use characteristics in Tables 29 and 30 for each of the subsectors.

7.3.1 Office Buildings

- Water billing records were available for 14 of the 26 surveyed office building establishments (54 percent).

- The 14 establishments resulted in a total of 129 daily water use data points (water consumption per billing period divided by the number of days in the billing period).

- Average daily water use for office buildings is approximately 3,918 gallons while the median is approximately 2,401 gallons. Daily water use for this subsector ranges from 67 gallons to 13,995 gallons.

- Average daily water use per 1,000 square feet is 147 gallons.

- Average daily water use per employee is 29 gallons.

It should be noted that it is suspected that water retailers may have had difficulties matching a unique surveyed office building with the actual water use record of that unique surveyed

[11] Dziegielewski, B., Kiefer, J., Opitz, E., Porter, G., Lantz, G., DeOreo, W., Mayer, P. & Nelson, J. (2000). *Commercial and Institutional End Uses of Water*. Denver, CO: American Water Works Association Research Foundation.

[12] Dziegielewski, B., Rodrigo, D. & Opitz, E. (1990). *Commercial and Industrial Water Use in Southern California*. Los Angeles, CA: Metropolitan Water District of Southern California.

[13] Planning and Management Consultants, Ltd. (1994). *IWR-MAIN Water Demand Analysis Software: User's Manual and System Description*. Carbondale, IL.

establishment. Therefore, there may be inaccuracies in the water use measurements (i.e., the values may overestimate or underestimate actual use associated with the surveyed establishment). This difficulty is represented by the fact that only 14 of the 26 establishments surveyed had associated water use records (the lowest of all subsectors). This is because many office buildings contain multiple businesses (multiple tenants) associated with it. In many cases, the account name on the retail water service may not have been the same as that business establishment surveyed (it depends upon who pays the water bill). It is not known how well the retail water providers were able to accurately match the surveyed establishment with the unique water account associated with it.

For comparison purposes, the AWWARF CI Study surveyed 67 office buildings, and average per employee water use from that study was 137 gallons per employee per day (ged), and the MWDSC Study reported 43 ged based upon a category representing miscellaneous commercial water use.

7.3.2 Semiconductor/Electronic Component Manufacturers

- Water billing records were available for 18 of the 28 surveyed establishments (64 percent).
- The 18 establishments resulted in a total of 178 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 24,087 gallons while the median is approximately 2,887 gallons. Daily water use for this subsector ranges from 52 gallons to 264,462 gallons.
- Average daily water use per 1,000 square feet is 597 gallons.
- Average daily water use per employee is 163 gallons.

In comparison, the IWR-MAIN Water Demand Analysis software showed an average daily water use of 169 ged and the MWDSC Study showed 333 ged.

7.3.3 Offices of Physicians or Dentists

- Water billing records were available for 14 of the 22 surveyed establishments (63 percent).
- The 14 establishments resulted in a total of 124 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 6,435 gallons while the median is approximately 3,568 gallons. Daily water use for this subsector ranges from 45 gallons to 46,354 gallons.
- Average daily water use per 1,000 square feet is 902 gallons.
- Average daily water use per employee is 362 gallons.

Similar to the case as office buildings, it is suspected that water retailers may have had difficulties matching a unique surveyed medical/dental office with the actual water use record of that unique surveyed establishment. Therefore, there may be inaccuracies in the water use measurements (i.e., the values may overestimate or underestimate actual use associated with the surveyed establishment). Again, physicians/dentists offices may have been in buildings with multiple

businesses (multiple tenants). In many cases, the account name on the retail water service may not have been the same as that business establishment surveyed (it depends upon who pays the water bill). It is not known how well the retail water providers were able to accurately match the surveyed establishment with the unique water account associated with it. Shared building space of physicians/dentists with other building tenants may also add uncertainty regarding whether or not water use for an irrigated landscape is accounted for in the water use record matched to the surveyed establishment (i.e., water use for landscaping may be paid by a building tenant or by the building owner based on separate irrigation meter).

The average daily water use per employee from the District sample was 362 ged, compared with the MWDSC Study of 1,287 ged for physician's offices and 175 ged for dentist's offices. The IWR-MAIN water use coefficients showed 203 ged for phyician's offices and 259 ged for dentists offices.

7.3.4 Fabricated Metal Product Manufacturers

- Water billing records were available for 16 of the 21 surveyed establishments (76 percent).
- The 16 establishments resulted in a total of 170 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 3,011 gallons while the median is approximately 1,174 gallons. Daily water use for this subsector ranges from 22 gallons to 19,545 gallons.
- Average daily water use per 1,000 square feet is 175 gallons.
- Average daily water use per employee is 118 gallons.

Comparable average daily water use per employee was obtained from the MWDSC Study at 304 ged and 154 ged from IWR-MAIN.

7.3.5 General Medical/Surgical Hospitals

- Water billing records were available for all 5 of the 5 surveyed establishments (100 percent).
- The 5 establishments resulted in a total of 53 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 27,913 gallons while the median is approximately 8,684 gallons. Daily water use for this subsector ranges from 217 gallons to 120,301 gallons.
- Average daily water use per 1,000 square feet is 187 gallons.
- Average daily water use per employee is 42 gallons.
- Average daily water use per hospital bed is 163 gallons.

The average daily water use per employee from the District sample (42 ged) is similar in magnitude with that from the MWDSC Study of 76 ged and IWR-MAIN of 75 ged.

7.3.6 Food Product Manufacturers

- Water billing records were available for 16 of the 22 surveyed establishments (73 percent).
- The 16 establishments resulted in a total of 180 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 12,000 gallons while the median is approximately 2,958 gallons. Daily water use for this subsector ranges from 45 gallons to 82,519 gallons.
- Average daily water use per 1,000 square feet is 795 gallons.
- Average daily water use per employee is 235 gallons.

The comparison studies reported higher water use per employee at 516 ged from the MWDSC Study and 469 ged from IWR-MAIN.

7.3.7 Hotels/Motels

- Water billing records were available for 20 of the 22 surveyed establishments (91 percent).
- The 20 establishments resulted in a total of 221 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 18,843 gallons while the median is approximately 10,577 gallons. Daily water use for this subsector ranges from 673 gallons to 106,620 gallons.
- Average daily water use per 1,000 square feet is 173 gallons.
- Average daily water use per employee is 321 gallons.
- Average daily water use per hotel bed is 55 gallons.

The comparison studies show a wide range of water use per employee with 230 ged from IWR-MAIN, 668 ged from the AWWARF CI Study, and 926 ged from the MWDSC Study.

7.3.8 Grocery Stores

- Water billing records were available for 19 of the 22 surveyed establishments (86 percent).
- The 19 establishments resulted in a total of 199 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 4,690 gallons while the median is approximately 2,820 gallons. Daily water use for this subsector ranges from 15 gallons to 28,177 gallons.
- Average daily water use per 1,000 square feet is 322 gallons.
- Average daily water use per employee is 128 gallons.

The average daily water use per employee for grocery stores from the District sample (128 ged) compares reasonably well with that reported by the comparison studies: 175 ged from the AWWARF CI Study at 175 ged, MWDSC Study at 352 ged, and IWR-MAIN at 94 ged.

7.3.9 Nursing Care Facilities

- Water billing records were available for 12 of the 15 surveyed establishments (80 percent).
- The 12 establishments resulted in a total of 130 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 16,027 gallons while the median is approximately 14,115 gallons. Daily water use for this subsector ranges from 6,889 gallons to 54,769 gallons.
- Average daily water use per 1,000 square feet is 1,009 gallons.
- Average daily water use per employee is 190 gallons.
- Average daily water use per in-patient is 341 gallons.

Average daily water use per employee from the District sample (190 ged) is nearly identical to the IWR-MAIN coefficient of 197 ged, though is substantive lower than that reported in the MWDSC Study (412 ged).

7.3.10 Wholesale Grocery/Related Product Facilities

- Water billing records were available for 15 of the 20 surveyed establishments (75 percent).
- The 15 establishments resulted in a total of 172 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 2,538 gallons while the median is approximately 494 gallons. Daily water use for this subsector ranges from 7 gallons to 17,256 gallons.
- Average daily water use per 1,000 square feet is 202 gallons.
- Average daily water use per employee is 198 gallons.

The average per employee water use from the District sample (198 ged) is exactly the same as that reported from the MWDSC Study, but slightly higher than that used in IWR-MAIN (103 ged).

7.3.11 Elementary/Secondary Schools

- Water billing records were available for 18 of the 22 surveyed establishments (82 percent).
- The 18 establishments resulted in a total of 177 daily water use data points (water consumption per billing period divided by the number of days in the billing period).
- Average daily water use is approximately 9,342 gallons while the median is approximately 4,084 gallons. Daily water use for this subsector ranges from 127 gallons to 109,021 gallons.

- Average daily water use per 1,000 square feet is 81 gallons.
- Average daily water use per employee is 120 gallons.
- Average daily water use per student is 15 gallons.

The comparison studies show a wide range of values for observed water use per employee ranging from 169 ged from IWR-MAIN to 623 ged from the MWDSC Study. The AWWARF CI Study reported 341 ged, but also an average daily water use per student of 24 gallons (compared with the District measurement of 15 gallons per student).

7.3.12 Summary

The water use statistics shown in the above sections are reflective of the water consumption records of the Baseline Study sample as provided by the District retail providers. As such, they may be helpful benchmarks against which the potential impacts of water conservation measures could be determined. The comparison between the District sample and the other comparative studies showed that in most cases the District sample was substantively less than that reported by the AWWARF CI Study and the MWDSC Study. Of 11 subsectors (excluding office buildings, and treating physicians/dentists as two separate subsectors), in 10 cases the District sample was more closely aligned with the national sample of nonresidential establishments represented by the IWR-MAIN water use coefficients than either of the other two studies. The only exception was that for wholesale grocery and related facilities, where the average water use per employee of the District sample was exactly the same as the MWDSC Study. Recognizing that the AWWARF CI Study was heavily weighted with establishments from arid climates (Southern California, Phoenix, and Denver) and the MWDSC Study strictly represented establishments from Southern California, the higher per employee water use from these studies may be reflective of higher amounts of water being used for irrigation purposes, as compared to the District service area. Therefore, a number of possible explanations for differences may be that: (1) water consumption data for the District study sample may not have fully represented all of the meters associated with given establishments, (2) there are distinct differences in the services provided or goods produced in the sampled establishments between the comparison data sets, (3) there may be differences in climate and weather conditions which impact the magnitude of outdoor irrigation between the comparison data sets (i.e., where less irrigation water is used in Santa Clara County as compared to Southern California). The following sections will explore the variations in water use among the surveyed establishments within the subsectors and investigate the determinants of water use.

7.4 Developing Models to Explain Variations in Water Use

With the site survey data for establishments, establishment-level historical water use records (generally for one-year), and weather data that coincide with the billing periods of the water use records, data analysis included the development of water use models that describe the relationship between water use patterns, facility characteristics, and weather patterns. The water use models are developed to measure the relative impact of facility characteristics and weather patterns on water use. In the model, the dependent variable will be water use and the independent (or explanatory) variables will be the weather data and the information collected from the site surveys. That is, the independent variables will be used to explain the variation in the dependent variable. Statistical water use models were developed to relate establishment water use in each of the 11 water use

subsectors against some likely explanatory variables. The water use models are intended to help explain that variations in water use among establishments in a given subsector. For example, why does water use in the fabricated metal product manufacturing subsector range from a minimum of 22 gallons per day for one establishment to a maximum of 19,545 gallons per day for another establishment? Is this variation caused by the size of the facility, the number of employees, the types of fixtures and appliances that exist at the establishment, etc.? Statistical water use models, developed through multiple regression methods, help to answer these questions.

The water use models incorporate variables that influence water use, including weather variables, scale variables (e.g., employment, square footage of building structure) and variables that may be unique to the specific subsector (e.g., number of hospital beds). The use of such explanatory variables provides a measure of water used for specific purposes (i.e., end use) based on total metered water use in the establishments and the presence (or absence) of specific purposes of water use obtained from survey data. This approach is based on the assumption that the variance of water use across different establishments of the same type can be explained by the mix and magnitude of water-using activities found in each establishment.

Within this process, explanatory variables representing water-using fixtures or equipment were formulated and specified in the models. These potential explanatory variables were specified as either binary (0/1) or integer values. Binary variables generally depict the presence or absence of the alternative water-using appliances or fixtures (i.e., 0 if the appliance/fixture does not exist at a given establishment or 1 if the appliance/fixture does exist). Integer variables generally indicate the count or scale of the variable in question.

As described previously, weather variables were developed for each unique customer-billing period. This enabled the models to account for weather influences from one billing period to the next. All weather data were extracted from the California Irrigation Management Information System (CIMIS) for a local station. Using daily weather data and the billing records, weather variables were calculated for average maximum daily temperature and total precipitation.

7.4.1 Water Use Models

Multiple regression statistical methods were used to estimate the water use models. Regression methods are commonly used to estimate a direct and quantifiable numeric relationship between a variable of interest (the dependent variable) and a set of independent variables that are hypothesized to affect or explain changes in the variable of interest. In its simplest form,

Water use in gallons per day per establishment (dependent variable)

= function of weather, site characteristics, existence of appliances/fixtures, number of appliances and fixtures (independent, or explanatory, variables)

The general linear regression model is expressed as:

$$Y_{i,t} = \alpha + \sum \beta_j X_{j,i,t} + \in_{i,j}$$

where:

Y = the dependent variable of interest (i.e. water use per day at location *i* in billing period *t*)

X	=	the explanatory or independent variables, n= *i* through *j* (e.g., employment, temperature)
α	=	an estimated model intercept term
β	=	estimated model parameters that measure the relationship between dependent variable *Y* and each explanatory variable *X*
$\in$	=	a random error term that denotes the difference between actual *Y*, and *Y* as estimated from the model
i	=	index denoting location
t	=	index denoting time period
j	=	index denoting independent variable

Ordinary Least Squares (OLS) multiple regression procedures were used to evaluate average daily water consumption per billing period by establishment as a function of independent variables that are hypothesized to affect or explain average daily water consumption in an establishment. The models were estimated in linear form. The following provide a brief explanation of the statistical measures provided with the water use models:

- Parameter estimate. The measured relationship between the noted explanatory variable and the dependent variable. In a linear equation, a one-unit change in the explanatory variable will have the impact of changing the dependent variable (average daily water use) in the direction (sign of) and by the magnitude of the *parameter estimate*.

- Standard error. This is an estimate of the standard deviation of the sampling distribution of the parameter estimate, which measures how much parameter estimates vary from one sample to the next sample of data.

- t value. This is equal to the parameter estimate divided by the standard error for that parameter. The *t* value is used to test the hypothesis that a parameter estimate differs significantly from zero. Common critical values for the *t* statistic are 1.65 (90 percent confidence that parameter estimate is different from zero), 1.96 (95 percent confidence that parameter estimate is different from zero), and 2.58 (99 percent confidence that parameter estimate is different from zero). Parameter estimates with *t* values greater than 1.0 add to the explanatory power (R-square) of the model, whereas parameter estimates with *t* values less than 1.0 decrease explanatory power of the model.

- Pr > |t|. This is the measured significance probability of the *t* value. Subtracting this value from 1.0 (1.0 - Pr > |t|) provides an estimate of the confidence level associated with the parameter estimate. A small probability value reinforces the hypothesis that there is very little chance that the parameter estimate is equal to zero.

- N. This represents the number of observations with non-missing values for all variables used in the model analysis.

- R-Square. This describes how much variation in the dependent variable is explained by variation in the set of explanatory variables contained in the model. R-square ranges from 0 to 1. The closer this value is to 1, the more the variation in the dependent variable is accounted for by variation in the independent or explanatory variables.

- Root mean square error. This provides a measure of the dispersion (or scatter) about the estimated regression line by comparing observed and predicted values. The minimum value for the root mean square error is zero. The higher the value, the greater is the average difference between observed values of the dependent variable and those predicted by the regression equation.

Table 31 lists and provides a brief description of the variables that were used in the regression models to estimate water use in the surveyed sample of establishments. Unique binary (0/1) variables were introduced to capture the effects of having particular water-using appliances or fixtures. Such variables were assigned a value of 1 when the fixture or equipment was present at an establishment and a value of 0 when the fixture or equipment was not present. Other variables include scale variables that count the number units and conservation variables that estimate the effects of using particular water conserving devices. Preliminary analysis of the data did eliminate some independent variables from use in the water use models. For example, the amount of rainfall was considered as a potential factor to account for variations in the level of water use. However, the rainfall variable's ability to explain variations in water use was not found in preliminary analyses to be statistically significant.

The following sections present the results of regressing average daily water use per establishment as the dependent variable against selected explanatory variables. Each subsector is evaluated separately.

7.4.2 Office Buildings

Table 32 presents the coefficient estimates and related statistics of the water use model for office buildings. The model is based on 112 observations and has an R-square of 0.6794, which means that 68 percent of the variance in the dependent variable (i.e., water use) is explained by the model. The following are the key findings from the model:

- The model shows a positive relationship between temperature and average daily water use (i.e., as air temperature increases, water use increases).

- The presence of landscape water uses at office buildings leads to an additional use of 1,353 gallons of water per day on average (though the parameter estimate is not statistically significant at a high level of confidence).

- Everything else in the model being held constant, every additional 1,000 square feet of office building area increases average daily water use by roughly 33 gallons.

- The presence of circulating hot water heating systems on average generates an additional 1,811 gallons of water use.

- The greater the number of low flush toilets relative to all toilets, the lower is water use. Estimates suggest that water use in facilities with all toilets being low-flush would use 2,870 gallons less water per day than facilities that have no low-flush toilets (all other variables in the model held constant).

- The greater the number of low flow faucets relative to all faucets, the lower the water use. The estimated model suggests that water use in facilities with all faucets being low flow would use

2,621 gallons less water per day than facilities that have no low flow faucets (all other variables in the model held constant).

TABLE 31 DESCRIPTION OF REGRESSION MODEL VARIABLES	
Age of Structure (2004 - yr. built)	This variable accounts for the age of the building structure by subtracting the year the building structure was built from the year 2004.
Avg. Max. Daily Air Temperature	The average maximum daily temperature for those days in a particular billing period. [(sum of maximum temperature per day)/ days in period]
Boilers (0/1)	Binary (0/1) variable denoting the presence (or absence) of boilers.
Circulating Hot Water Heating (0/1)	Binary (0/1) variable denoting the presence (or absence) of circulating hot water heating at an establishment.
Cooling Towers (0/1)	Binary (0/1) variable denoting the presence (or absence) of cooling towers at an establishment.
Dishwashing Machines (0/1)	Binary (0/1) variable for the presence (or absence) of dishwashing machines at an establishment.
Garbage Disposals (count)	Number of garbage disposals.
Indoor Pressure Regulators (0/1)	Variable to capture the presence of indoor pressure regulators.
Kitchens (count)	Number of kitchens at a facility.
Kitchen Facilities (0/1)	Binary (0/1) variable simply depicting the presence (or absence) of kitchen facilities at an establishment.
Landscape Water Uses (0/1)	The presence of landscape water uses.
Low Flow Faucets/All Faucets Ratio	The number of sampled low flow faucets at an establishment (2 gallons or less per minute) divided by the total number of sampled faucets at that establishment.
Low Flow Showers/All Showers Ratio	The number of sampled low flow showerheads at an establishment (2 gallons or less per minute) divided by the total number of sampled showerheads at that establishment.
Low Flush Toilets/All Toilets Ratio	The number of sampled low flush volume toilets at an establishment (2 gallons or less per flush) divided by the total number of sampled toilets at that establishment.
Miscellaneous Water Use (0/1)	Variable denoting the presence of miscellaneous water uses.
Number of Employees (count)	Number of employees at an establishment.
Number of Patients (count)	Number of patients at an establishment.
Once-Through Cooling (0/1)	Binary variable denoting the presence of a once-through cooling system
Original Facilities Remodeled (0/1)	Binary variable indicating the presence of major remodeling to the original facilities.
Pools (0/1)	Binary variable for the presence of swimming pools.
Size of Building (in 1000 sq. ft.)	Building size in 1,000 square feet.
Ultra Pure Water Used (0/1)	Binary variable denoting that the use of ultra pure water.
Washing and Sanitation (0/1)	Binary variable denoting the presence of washing and sanitation water use.
Water for Product Mfg. (0/1)	Binary variable denoting the presence of process water for product manufacturing.
Water for Product Rinsing Units (0/1)	Binary variable denoting the presence of process water for product rinsing units.
Water purification equipment (0/1)	Binary variable denoting the presence of process water purification equipment
Water Purification Equip. (count)	Number of process water purification equipment
Water to Convey Product (0/1)	Binary variable denoting the presence of process water to convey product.

TABLE 32 WATER USE MODEL FOR OFFICE BUILDINGS				
Variable	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	-9896.35381	2444.96017	-4.05	<.0001
Avg. Max. Daily Air Temperature	177.65201	30.40696	5.84	<.0001
Size Of Building (In 1000 Sq. Ft.)	32.81034	6.61532	4.96	<.0001
Circulating Hot Water Heating (0/1)	1811.06172	627.30016	2.89	0.0047
Low Flush Toilets/All Toilets Ratio	-2870.30207	654.78333	-4.38	<.0001
Low Flow Faucets/All Faucets Ratio	-2621.41084	750.26516	-3.49	0.0007
Landscape Water Uses (0/1)	1353.43686	981.08554	1.38	0.1707
N = 112 R-Square = 0.6794 Root Mean Square Error = 2250.76272 Dependent Variable: Average Daily Water Use (gallons) = 3794.63071				

7.4.3 Semiconductor/Electronic Component Manufacturers

Table 33 presents the estimated model for explaining water use variations in the semiconductor/electronic component manufacturer subsector. The following are the key findings from the model:

- Everything else in the model being held constant, each additional employee increases average daily water use by 287 gallons[14].
- The presence of cooling towers at a facility tends to increase use by 13,374 gallons per day on average in the modeling sample.

TABLE 33 WATER USE MODEL FOR SEMICONDUCTOR/ELECTRONIC COMPONENT MANUFACTURERS				
Variable	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	-22599	2740.13694	-8.25	<.0001
Number of Employees (count)	287.34771	7.88833	36.43	<.0001
Cooling Towers (0/1)	13374	3188.90994	4.19	<.0001
Circulating Hot Water Heating (0/1)	8011.31408	3274.70844	2.45	0.0154
Water for Product Mfg. (0/1)	6555.80712	3198.40788	2.05	0.0419
N = 178 R-square = 0.9224 Root mean square error = 17532 Dependent variable: average daily water use (gallons) = 24087				

[14] The additional water use associated with each additional employment may not necessarily mean that each new employee will use that much water. It is highly likely that this variable is a proxy variable that is also capturing that impact of establishment size. Typically higher employment numbers are associated with larger establishments.

- The presence of circulating hot water heating systems and the use of process water for product manufacturing are shown to increase average water use by 8,011 and 6,556 gallons respectively, for sample facilities having these end uses.

7.4.4 Offices of Physicians or Dentists

Table 34 presents the regression model for offices of physicians or dentists. The model is specified using explanatory variables that were found to be prevalent in this subsector. The following are the key findings from the model:

- The model explains 85 percent of the variation in average daily water use among observations in the offices of physicians or dentists sample. However, there were no variables that were statistically significant that captured the size of the establishment (i.e., square footage or employment) which limits the model's practicality.

- Based on the sampled establishments, the use of ultra pure water at a facility increases average daily water use by about 30,109 gallons. (However, it should be noted that this value seems to be high; and the variable may be capturing other characteristics that are unique to those few establishments that use ultra pure water.)

- Holding everything else constant in the model, the use of water for washing and sanitation purposes on average adds roughly another 2,383 gallons of water per day.

- The presence of kitchen facilities on average adds about 3,144 gallons a day.

- The coefficient for low flush toilets suggests that all other things being equal, a facility using low-flush toilets exclusively would reduce consumption by 8,296 gallons a day over a facility that had no toilets of the low flush variety.

- Average daily water use is also shown to increase with higher average daily maximum temperature.

TABLE 34
WATER USE MODEL FOR OFFICES OF PHYSICIANS OR DENTISTS

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-14939	3497.18975	-4.27	<.0001
Avg. Max. Daily Air Temperature	217.25738	47.44525	4.58	<.0001
Ultra Pure Water Used (0/1)	30109	1285.52954	23.42	<.0001
Washing and Sanitation (0/1)	2383.46334	866.95951	2.75	0.0069
Kitchen Facilities (0/1)	3143.82964	1188.91560	2.64	0.0093
Miscellaneous Water Use (0/1)	3118.97909	870.94557	3.58	0.0005
Low Flush Toilets/All Toilets Ratio	-8296.01680	1134.03730	-7.32	<.0001

N = 124
R-square = 0.8496
Root mean square error = 3676
Dependent variable: average daily water use (gallons) = 6435

7.4.5 Fabricated Metal Product Manufacturers

Table 35 presents regression coefficients for the fabricated metal product manufacturer subsector. The model is based on 159 observations and has an R-square value of 0.7411. The following are the key findings from the model:

- The model accounts for roughly 74 percent of the variation average daily water use in the fabricated metal product manufacturer sample.
- The use of water for washing and sanitation purposes on average adds about 2,980 gallons per day in water use in the sample.
- The presence of cooling towers, circulating hot water heating systems and boilers respectively on average contribute to an additional 3,150; 2,465; and 10,882 gallons of water being used per day among sample establishments.
- The presence of landscape water uses, increases in temperature and the number of employees marginally increase average daily water use. However, the parameter estimate for average maximum daily air temperature is not statistically significant at a high level of confidence.
- Each employee is estimated to add approximately 90 gallons per day of consumption.
- All else being equal in the model, the presence of indoor pressure regulators reduces daily water use by approximately 8,265 gallons on average.

TABLE 35
WATER USE MODEL FOR FABRICATED METAL PRODUCT MANUFACTURERS

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-6192.19033	2081.82481	-2.97	0.0034
Avg. Max. Daily Air Temperature	36.85474	28.52385	1.29	0.1983
Number of Employees (count)	90.95197	13.42029	6.78	<.0001
Washing and Sanitation (0/1)	2980.15647	559.89287	5.32	<.0001
Cooling Towers (0/1)	3150.28942	754.26045	4.18	<.0001
Circulating Hot Water Heating (0/1)	2464.84978	593.27431	4.15	<.0001
Boilers (0/1)	10882	801.24213	13.58	<.0001
Landscape Water Uses (0/1)	2537.79848	791.10885	3.21	0.0016
Indoor Pressure Regulators (0/1)	-8264.84094	1055.51628	-7.83	<.0001

N = 159
R-square = 0.7411
Root mean square error = 2617
Dependent variable: average daily water use (gallons) = 3102

7.4.6 General Medical/Surgical Hospitals

Table 36 presents the model for estimating water use in the general medical/surgical hospital subsector. This model relied on very few observations (53) compared to models developed for other subsectors. The model has an R-square of 0.9144. The following are the key findings from the model:

- The model explains roughly 91 percent of the variation average daily water use in the sample.
- All else being equal in the model, the presence of cooling towers on average adds an additional 24,229 gallons to average daily water use.
- Higher temperatures and larger number of employees result in establishments having marginally higher average daily water estimates.
- All else being equal in the model, if all toilets in an establishment are of the low flush variety, this reduces average water consumption by 63,473 gallons per day relative to an establishment with no toilets of low flush varieties.

TABLE 36
WATER USE MODEL FOR GENERAL MEDICAL/SURGICAL HOSPITALS

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-44820	14440	-3.10	0.0032
Avg. Max. Daily Air Temperature	582.06352	202.57824	2.87	0.0060
Number of Employees (count)	87.96435	4.54391	19.36	<.0001
Cooling Towers (0/1)	24229	8644.90746	2.80	0.0073
Low Flush Toilets/All Toilets Ratio	-63473	10625	-5.97	<.0001

N = 53
R-square = 0.9144
Root mean square error = 11196
Dependent variable: average daily water use (gallons) = 27913

7.4.7 Food Product Manufacturers

Table 37 shows the estimated model for the food product manufacturing subsector. The model is based on 144 observations and has an R-square of 0.7846. The following are the key findings from the model:

- The model accounts for 78 percent of the variation in average daily water use in this sample.
- All other things being equal in the model, the presence of cooling towers and boilers on average adds an additional use of 13,189 gallons and 15,227 gallons per day respectively.
- The presence of process water for product rinsing units increases water use by 8,754 gallons a day on average.
- The presence of process water to convey products adds approximately 4,009 gallons to the average daily water use estimate, given all other variables in the model.
- Temperature and the number of employees both positively impact water use. However, the parameter estimate for average maximum daily water use is not statistically significant at a high level of confidence. Each employee on average adds 217 gallons of water use.
- Older structures in the sample on average use more water, suggesting the newer the establishment the more efficient is the structure.

- Establishments that implemented some fixture remodeling roughly reduce average water use by 28,069 gallons per day relative to those that had not.

TABLE 37
WATER USE MODEL FOR FOOD PRODUCT MANUFACTURERS

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-34671	9083.85809	-3.82	0.0002
Avg. Max. Daily Air Temperature	31.35157	118.37372	0.26	0.7915
Number of Employees (count)	217.21087	22.74742	9.55	<.0001
Age of Structure (2004 - yr. built)	777.23778	110.65056	7.02	<.0001
Cooling Towers (0/1)	13189	2160.25191	6.11	<.0001
Boilers (0/1)	15227	2685.15867	5.67	<.0001
Water for Product Rinsing Units (0/1)	8754.27784	2670.05186	3.28	0.0013
Water to Convey Product (0/1)	4009.24202	3961.36128	1.01	0.3133
Original Facilities Remodeled (0/1)	-28069	3146.38660	-8.92	<.0001

N = 144
R-square = 0.7846
Root mean square error = 9975
Dependent variable: average daily water use (gallons) = 12903

7.4.8 Hotels/Motels

The water use model for the hotel/motel subsector is shown in Table 38. This model is based on 168 observations of average daily water use and has an R-square of 0.7325. Key findings from the model are as follows:

- The model is able to explain approximately 73 percent of the variation in average daily water use.
- The presence of cooling towers on average increases average daily water use at an establishment by 8,305 gallons.
- The presence of boilers on average adds an additional 5,844 gallons to average daily water use.
- The model suggests that a hotel/motel with all showers fitted with low flow showerheads would reduce average daily water use by 7,938 gallons relative to hotel/motels having no showers fitted with low flow devices.
- Everything else in the model being held constant, hotel/motels with indoor pressure regulators use about 11,960 less gallons of water per day.
- The presence of a swimming pool leads to an additional use of 2,050 gallons of water per day on average.
- Higher temperatures and larger numbers of employees are associated with marginal increases in average daily water use. Each employee is estimated to add 134 gallons of water use per day.

TABLE 38 WATER USE MODEL FOR HOTELS/MOTELS				
Variable	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	-22011	5698.00024	-3.86	0.0002
Avg. Max. Daily Air Temperature	350.02533	80.02548	4.37	<.0001
Number of Employees (count)	133.69479	16.11179	8.30	<.0001
Cooling Towers (0/1)	8304.86713	1709.92278	4.86	<.0001
Boilers (0/1)	5844.10325	2423.21125	2.41	0.0170
Low Flow Showers/All Showers Ratio	-7938.40168	4534.90955	-1.75	0.0819
Indoor Pressure Regulators (0/1)	-11960	1904.71128	-6.28	<.0001
Pools (0/1)	2049.57078	1439.63196	1.42	0.1565
N = 168 R-square = 0.7325 Root mean square error = 7551 Dependent variable: average daily water use (gallons) = 15836				

7.4.9 Grocery Stores

Coefficient estimates and related statistics of the water use model for grocery stores are provided in Table 39. The model was generated from 152 observations of average daily water use and has an R-square of 0.6332. The model suggests the following:

- Keeping everything else in the model constant, grocery stores with cooling towers on average use 4,193 more gallons of water per day than those without cooling towers.
- Everything else being equal, grocery stores with boilers use roughly 9,296 more gallons of water per day than those without boilers.
- The use of water for landscaping leads to an additional use of 3,732 gallons of water per day.

TABLE 39 WATER USE MODEL FOR GROCERY STORES				
Variable	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept	-14870	2368.98316	-6.28	<.0001
Avg. Max. Daily Air Temperature	90.03874	30.35462	2.97	0.0035
Number of employees (count)	32.78154	10.68406	3.07	0.0026
Age of Structure (2004 - yr. built)	208.35588	15.98420	13.04	<.0001
Cooling Towers (0/1)	4192.61241	635.55168	6.60	<.0001
Boilers (0/1)	9295.53585	1007.95371	9.22	<.0001
Landscape Water Uses (0/1)	3732.41188	622.10975	6.00	<.0001
N = 152 R-square = 0.6332 Root mean square error = 2622.02618 Dependent variable: average daily water use (gallons) = 4294.30737				

- All else in the model being equal, older structures use more water per day.
- Higher temperatures and larger numbers of employees are associated with higher average daily water use.

7.4.10 Nursing Care Facilities

Table 40 shows the estimated model for the nursing care facilities subsector. The model is based on 96 observations of average daily water use and has an R-square of 0.8592. The following are main findings from the model:

- The model account for 86 percent of the variation in average daily water use in the sample.
- Establishments with dishwashers on average use 1,715 more gallons of water per day, holding constant all other variables in the model.
- A unit increase in the number of garbage disposals on average increases average daily water use of the sample of establishments by 317 gallons.
- Similarly, a unit increase in the number of water purification systems is on average associated with an addition of 472 gallons of daily water use.
- All else being equal in the model, if all toilets in an establishment are of the low flush variety, this reduces average water consumption by 7,938 gallons per day relative to an establishment with no toilets of low flush varieties.
- Higher temperatures and higher number of patients per day on average result in increases in average daily water use. A unit increase in the number of patients on average increases daily water use by 24 gallons.

TABLE 40
WATER USE MODEL FOR NURSING CARE FACILITIES

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-15419	3868.88549	-3.99	0.0001
Avg. max. daily air temperature	355.37839	53.04872	6.70	<.0001
Number of patients (count)	24.26879	4.99425	4.86	<.0001
Dishwashing machines (0/1)	1715.60690	1071.98083	1.60	0.1131
Garbage disposals (count)	317.13546	46.46514	6.83	<.0001
Water purification equip. (count)	472.22294	281.05378	1.68	0.0964
Low flush toilets/all toilets ratio	-3397.55504	1652.30081	-2.06	0.0427

N = 96
R-square = 0.8592
Root mean square error = 3750.98779
Dependent variable: average daily water use (gallons) = 18112

7.4.11 Wholesale Grocery/Related Product Facilities

Table 41 presents the estimated model for explaining water use variations in the wholesale grocery/related product facilities subsector. The model is based on 114 observations and has an R-square of 0. 8537. The bullets below list the main findings of the model:

- The model accounts for roughly 85 percent of the variation in average daily water use in the sample.
- The presence of process water for product rinsing units adds an additional 1,393 gallons to average daily water use if all other values of variables are held constant in the model.
- The presence of once-through cooling systems on average adds an additional 2,492 gallons of average daily water use.
- All else being equal in the model, if all toilets in an establishment are of the low flush variety, this reduces average water consumption by 2,283 gallons per day relative to an establishment with no toilets of low flush varieties.
- Everything else in the model kept constant, the presence of kitchen facilities adds 2,486 additional gallons to the average daily water use among the sample.
- Everything else kept constant, each additional 1,000 square feet of building area in the surveyed establishments on average increases average daily water use by 65 gallons.
- Older structures and higher temperatures typically result in increases in average daily water use.

TABLE 41
WATER USE MODEL FOR WHOLESALE GROCERY/RELATED PRODUCT FACILITIES

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-6875.92605	1727.91835	-3.98	0.0001
Avg. Max. Daily Air Temperature	20.42589	18.56882	1.10	0.2738
Size of Building (in 1000 sq. ft.)	65.47399	5.68429	11.52	<.0001
Age of Structure (2004 - yr. built)	109.76487	18.13525	6.05	<.0001
Water for Product Rinsing Units (0/1)	1392.53843	554.20925	2.51	0.0135
Once-Through Cooling (0/1)	2491.56339	521.74205	4.78	<.0001
Low Flush Toilets/All Toilets Ratio	-2283.20174	277.56112	-8.23	<.0001
Kitchen Facilities (0/1)	2485.80165	645.60603	3.85	0.0002

N = 114
R-square = 0.8537
Root mean square error = 1333.41150
Dependent variable: average daily water use (gallons) = 1592.45263

7.4.12 Elementary/Secondary Schools

Table 42 presents the water use model developed for the elementary/secondary school water use subsector. The model was developed based on 173 observations and has an R-square of 0.5150. The main findings from the model are as follows:

- The model explains approximately 51 percent of the variation in average daily water use of the elementary/secondary school survey sample.
- Holding everything else constant in the model, the presence of once-through cooling systems at an establishment on average adds an additional 8,461 gallons to the average daily water use estimate.
- Similarly, establishments that use circulating water for heating use 6,997 more gallons of water on average.
- The presence of a swimming pool on average leads to an additional use of 7,380 gallons of water per day.
- Higher temperatures and larger numbers of employees are associated with higher average daily water use. Each employee is estimated to add 132 gallons of water use per day.

TABLE 42
WATER USE MODEL FOR ELEMENTARY/SECONDARY SCHOOLS

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	-58177	7956.09552	-7.31	<.0001
Avg. Max. Daily Air Temperature	589.71961	105.26858	5.60	<.0001
Number of Employees (count)	132.38605	25.57936	5.18	<.0001
Once-Through Cooling (0/1)	8461.22490	2351.34590	3.60	0.0004
Circulating Hot Water Heating (0/1)	6997.39266	1995.09606	3.51	0.0006
Kitchens (count)	4862.03672	746.84420	6.51	<.0001
Pools (0/1)	7380.47790	2269.78916	3.25	0.0014

N = 173
R-square = 0.5150
Root mean square error = 10499
Dependent variable: average daily water use (gallons) = 9508.11769

7.4.13 Modeling Conclusions

The models that have been developed and described above for the different water-using subsectors have shown that a significant amount of variance in water use can be explained by the presence (or absence) of various water-using fixtures or equipment in an establishment. Generally, higher temperatures are associated with marginal increased water use. Higher counts on scale variables (e.g., such as the number of employees, the number of building square feet and the number of patients) also tend to increase average daily water use of the sample. Specific water-using fixtures and equipment have been found to have different levels of influence depending on the subsector in question. The estimates consistently confirm the water-conserving effects of low-flow toilets and showerheads and other efficiency improvements.

Note that the sample sizes upon which the models are based (ranging from 5 hospitals to 20 hotels/motels) are generally small for this type of analysis. In order to more fully explain the variations in water use within the subsectors and enhance the validity of the water use models, it is recommended that: (1) additional samples of subsector establishments be obtained and (2) the water use records of the existing sampled establishments be validated to ensure that the water use record matched with given establishment does fully represent the surveyed facility (i.e., verify that all associated meters are represented, and address issues of shared facilities). Given the small sample sizes of the subsector water use models, the magnitude of some of the explanatory variables may be indicative of the fact that the variables may be capturing other unmeasured characteristics. The parameter estimates for the explanatory variables should be used as an estimate of the potential impact on water use rather than a definitive result.

Section 8
Summary and Conclusions

The results of the CII Baseline Study provide a wealth of information to the District for planning and evaluating water conservation program initiatives. This information can be used by the District to do the following:

- Gain an understanding of the relative impacts of previous water conservation efforts in the District. Depending upon the nature and extent of previous water efficiency program initiatives, the impacts of previous water conservation efforts may be inherent in the findings of the Baseline Study (i.e., the Baseline Study shows conditions that existed during the time of the survey; conditions which may have been already impacted by the previous water conservation program initiatives of the District). The District may have quantitative or qualitative assessments of water use characteristics of CII customers prior to the Baseline Study (e.g., percentages of customers with low-flush toilets), upon which to compare Baseline Study results. Without the ability to conduct comparisons of the current Baseline Study characteristics with previous conditions, this relative impact of previous water conservation efforts may be intuitive or qualitative in nature.

- Develop a forecast of the nature and extent of future water use in the District's CII sector under current water use conditions. The average rates of water use (in Section 7, Table 29) provide three benchmarks of water use by subsector for the Baseline Study sample: average daily water use per establishment, average daily water use per employee, and average daily water use per square foot of building space. Given projections of specified drivers (number of establishments per subsector, number of employees per subsector, and number of square feet of building space per subsector), these data may be used to estimate future water use in given subsectors. Given specific assumptions about the potential for water use efficiency impacts in terms of percentage reductions, future water use by subsectors may be projected under varied conservation scenarios.

- Be able to develop quantifiable estimations of the impacts of future potential alternative water conservation initiatives. The Baseline Study measured specific characteristics at a specific point in time. Future water efficiency program initiatives may target specific types of end uses. For example, the impact of a targeted initiative for replacing older, less efficient toilets may be discernable against baseline characteristics with future surveys of similar characteristics. The Baseline Study also provides detailed end use characteristics upon which potential water savings from various water efficiency program initiatives could be calculated, using specific assumptions regarding reductions, intensity of use, and market penetrations.

- Develop an effective outreach program that target specific water use conditions in the CII sector. The Baseline Study measured not only the types of end uses of water that exist within specific subsectors, but also measured establishment and subsector perceptions and likelihood of potential future program participation. This information should be used in designing implementation conditions and targeted subsectors of water efficiency program initiatives.

Given the Baseline Study results, the following are specific observations regarding the subsectors addressed in the study.

- Office Buildings. In terms of the likelihood of participation in a future water conservation program initiative, the establishments in the office building subsector sample rated a full-scale audit for outdoor uses as its highest rated program. This program could potentially have substantive impacts on increasing water use efficiency, as the water use model (Table 32) indicated that the presence of landscape water uses at office buildings leads to an additional use of 1,353 gallons of water per day on average. Office buildings also had high percentages of facilities using water for heating/cooling (96 percent), once-through cooling systems, and kitchen facilities. These may be targeted end uses for water efficiency program initiatives.

- Semiconductor/Electronic Component Manufacturers. With regard to their ratings of participation in future water conservation program initiatives, the sampled establishments in this subsector rated a voluntary program to convert existing landscaping supported by grants (3.92, on scale of 1 to 5) as their highest-rated program. Other higher rated conservation programs included a toilet replacement program with incentives (3.60) and an audit program targeting plumbing fixtures (3.56). Note that the sampling of toilets showed that toilets in semiconductor facilities were fairly efficient, with 72 percent of sampled toilets flushing at 2 gallons per flush or less. Note that this subsector also has a high percentage of facilities using water for facility cooling/heating (86 percent) and as process water for manufacturing (71 percent), and as demonstrated by the water use model in Table 33, these uses contribute significantly to the level of water use in this subsector. Both of these end uses are potential targets for increases in water use efficiency.

- Offices of Physicians or Dentists. Targets for increases in water use efficiency in this subsector are primarily plumbing fixtures (including faucets in exam rooms), kitchen facilities, x-ray processing equipment, and water used for general washing and sanitation of the facility. This is exemplified in the water use model in Table 34. There appears to be opportunities for toilet replacement in this subsector, as 20 percent of the toilets were found to flush at rates of 4 gpf or greater. Faucets in this subsector were found to have fairly high flow rates, with 30 percent having flow rates at 3.0 gpm or higher. The establishments in this subsector rated a toilet replacement program with incentives as their highest rated program for potential participation.

- Fabricated Metal Product Manufacturers. Targets for increases in water use efficiency in this subsector include water used for facility cooling/heating, washing and sanitation, and process water for manufacturing. Although only 24 percent of the sampled establishments used water for landscaping purposes, the water use model in Table 35 showed that significant amounts of water (2,537 gpd) were used for those establishments that had this end use. Sixteen percent of toilets in this subsector had flush rates of 4 gpf or greater, and faucets also had a higher than average flow rate (3.19 gpm). The highest rated potential water conservation program by this subsector was a full-scale facility audit for indoor uses.

- General Medical/Surgical Hospitals. Targets for increases in water use efficiency in this subsector would be plumbing fixtures (due to the high number of fixture counts), water used for facility cooling/heating, laundry and kitchen facilities, general facility washing and sanitation, special purpose uses (x-ray equipment), and landscape uses. The water use model (Table 36) showed the strength of the relative impact of average maximum daily temperature on water use, indicating the higher levels of water being used for both landscaping and potentially for cooling purposes. Thirty percent of toilets in this subsector had flush rates of 4 gpf or greater, and faucets also had a higher than average flow rate (3.09 gpm). The highest rated potential water

conservation program by these sampled establishments in this subsector was equipment/appliance rebate programs.

- Food Product Manufacturers. Targets for increases in water use efficiency in this subsector would be water used for facility cooling/heating and process water for manufacturing. As shown in the Table 37 water use model, these types of uses were significant in explaining the variability of water use in this subsector. A large percentage of facilities in this subsector also reported using water for kitchens (which may actually be part of manufacturing process), and for general facility washing and sanitation. Thirty-eight percent of toilets in the subsector had flush rates of 4 gpf or greater. Food product manufactures in the Baseline Study sample rated a toilet replacement program as that water efficiency program with which they would be most likely to participate (4.47).

- Hotels/Motels. Targets for increases in water use efficiency in this subsector would be plumbing fixtures (due to the high number of fixture counts) and water used for facility heating/cooling, laundry and kitchen facilities, and landscaping purposes. The water use model in Table 38 showed the strength of the relative impact of average maximum daily temperature on water use, indicating the higher levels of water being used for both landscaping and potential cooling purposes. There is a potential for increases in water use efficiency in toilets (22 percent of toilets have flush rate greater than 4 gpf), and showers (40 percent of showers have a flow rate of 3 gpm or greater). The potential for water use efficiency in laundry facilities should also be further investigated, as 86 percent of establishments reported these facilities on-site, with an average clothes washer capacity of 63 pounds of material. The highest rated potential water conservation program by this subsector was a full-scale facility audit for indoor uses.

- Grocery Stores. Targets for increases in water use efficiency in this subsector would be primarily water used for facility cooling/heating and kitchen facilities. A very low percentage of establishments in this subsector reported using water for landscaping (32 percent). However, as demonstrated by the water use model in Table 39, those establishments that did have landscapable areas were found to use 3,732 gpd more water than those that did not. The number of sanitary plumbing fixtures per establishment is fairly small, but there may be potential for increases in water use efficiency in toilets and faucets. The grocery stores in the Baseline Study sample rated a water conservation program with equipment/appliance rebates as their highest rated choice.

- Nursing Care Facilities. Targets for increases in water use efficiency in nursing care facilities would be plumbing fixtures (due to the high number of fixture counts), and water used for facility heating/cooling, laundry and kitchen facilities, general facility washing and sanitation, and landscape uses. There appears to be significant opportunities to target toilets, as 36 percent of toilets tested in this subsector have flush rates greater than 4.0 gpf. All of the sampled facilities reported using water for landscaping purposes and as demonstrated by the water use model in Table 40, there is a strong relationship between water use and average maximum daily temperature. The water use model also showed that nursing care facilities with dishwashers used, on average, 1,715 gpd more water than those that did not. The nursing care facilities in the Baseline Study were more likely to participate in full-scale audits of indoor and outdoor uses compared to other programs.

- Wholesale Grocery/Related Products Facilities. As indicated previously, this subsector was one of the more heterogeneous groups with respect to the types of goods/services of the facilities. As

indicated by the water use model in Table 41, the size of the facility and the age of the structure both contributed to explaining the variance of water use in this subsector, as also did whether water was used for product rinsing and the existence of once-through cooling systems. Mean per establishment employment is fairly low (29), as is the average number of sanitary plumbing fixtures per site. However, 32 percent of toilets in this subsector had flush rates of 4 gpf or greater and the subsector also had greater than average flow rates from faucets. The establishments in this subsector did not provide significant interest in participating in water conservation program initiatives, as the highest rated program was that to incorporate recycled water for outdoor uses, although only 30 percent of these facilities reported using water for landscaped purposes.

- Elementary/Secondary Schools. Targets for increases in water use efficiency in elementary/secondary schools would be plumbing fixtures (due to the high number of fixture counts), and water used for facility heating/cooling, kitchen facilities, general facility washing and sanitation, and landscape uses. Toilets and faucets were found to be fairly efficient in this subsector, with only 10 percent of toilets tested having flush rates greater than 4.0 gpf and the lowest average faucet flow rates of all subsectors. Ninety-five percent of the sampled facilities reported using water for landscaping purposes, and as demonstrated by the water use model in Table 42, there is a strong relationship between water use and average maximum daily temperature. The water use model also showed that the existence of swimming pools at schools leads to an increase of 7,389 gpd. The schools in the Baseline Study rated full-scale facility audits for outdoor uses as their highest rated program.

As additional water efficiency programs are implemented in the District service area, it is important for planning and evaluation purposes to monitor water use patterns and to evaluate the impacts of water efficiency programs. To provide feedback into the water conservation program planning (i.e., for designing acceptable and cost-effective programs), it may also be helpful to conduct evaluations of individual programs. Therefore, it is recommended that the District consider three primary components of a long-term monitoring and evaluation program:

1. Water Use Monitoring Program. With cooperation of the retail water providers, this would include tracking annual water use of major sectors and subsectors of water-using customers. This will be helpful in being able to predict water use with and without water efficient program efforts.

2. Water Efficiency Monitoring Program. This could include the estimation of water use for various purposes (e.g., toilets, showers, landscaping, cooling, etc.) and the assessment of potential water efficiency program impacts on the various components of water use to determine program savings.[15] This may also involve performing detailed audits of selected facilities including measuring quantities of water being used for specific end uses through submetering and/or data logging.[16]

3. Special studies and periodic surveys. This could include detailed empirical evaluations of specific water efficiency program efforts and periodic surveys to provide feedback into the water

[15] This type of analysis can be performed using models such as the IWR-MAIN Water Demand Management Suite or similar models.

[16] See Dziegielewski, B., Kiefer, J., Opitz, E., Porter, G., Lantz, G., DeOreo, W., Mayer, P. & Nelson, J. (2000). *Commercial and Institutional End Uses of Water*. Denver, CO: American Water Works Association Research Foundation.

conservation planning. Given that the Baseline Study measured characteristics as they existed at a given point in time, periodic surveys of similar measurements can be performed to compare results against the measured characteristics of this Baseline Study. In the preliminary study design for the Baseline Study, it was acknowledged that the Baseline Study targeting 11 subsectors (and surveying approximately 20 establishments per subsector) could be considered a *pilot study*, yielding practical information on CII subsectors rather than high levels of statistical significance on measured parameters. If the District seeks statistical significance for specific measurement parameters, then additional data collection (or surveys) would be warranted. Certainly, the Baseline Study results provides a solid basis for determining the type of information that would need to be collected and the samples sizes that would be required to achieve higher levels of statistical significance.

Appendix A
Implementation Plan

Implementation Plan for the Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study

January 2004

Implementation Plan for the Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study

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Acronyms

CII	Commercial, Industrial and Institutional
NAICS	North American Industry Classification System
SCVWD	Santa Clara Valley Water District

Section 1
Introduction and Background

The Santa Clara Valley Water District (SCVWD) is the wholesale supplier of water in California's Santa Clara County, the boundaries of which coincide exactly with the District's 1,300 square-mile service area. The SCVWD provides water to 1.7 million people via its service to 13 water retailers throughout its jurisdiction, including to the San Jose Water Company, which accounts for about half of the total water use in the District. The other major water retailers served by SCVWD include the California Water Services Company, the Gilroy Community Services Department, the Purissima Hills Water District, the City of Milpitas Community Services, the City of Morgan Hill Public Works Department, the City of Mountain View Public Services Department, the City of Palo Alto Utilities Department, the Great Oaks Water Company, the San Jose Municipal Water System, the City of Santa Clara Water Department and the City of Sunnyvale Public Works Department.

The objective of the SCVWD Nonresidential Water Use and Conservation Baseline Study is to provide guidance to the District in its efforts to cost effectively allocate its water conservation resources. Two fundamental bases of knowledge are critical to the attainment of this objective. First, the District must have knowledge of the prevalent types of water using equipment, fixtures and appliances in the major water-using subsectors of its Commercial, Industrial and Institutional (CII) water using sectors. Second, the District must be able to generally characterize the nature of this water use.

The CDM study team's proposed plan for implementing the SCVWD Nonresidential Water Use and Conservation Baseline Study explains how these critical knowledge bases will be constructed throughout the term of this study. The details of the implementation plan and an explanation of how the study results will be reported are found respectively in Sections 3 and 4 of this document and are preceded by the following review of the general study approach the District and CDM have agreed upon.

Section 2
Study Approach

The general approach for the Nonresidential Water Use and Conservation Baseline Study was designed in close consultation with SCVWD personnel through a series of evaluations of potential subsector targets and survey approaches. The following are the respective rationales for selecting the 11 subsectors that will be targeted for surveys in the study and the survey approaches that will be applied to each.

A. Rationale for Target Subsectors

In preparing for the August 2003 working session with SCVWD personnel to prioritize study target subsectors, the CDM study team prepared lists of establishment and employee counts in all CII subsectors in Santa Clara County aggregated to the 3-digit North American Industry Classification System (NAICS)-code level (as derived from the U.S. Bureau of Census' County Business Patterns Database). Each subsector listing was accompanied by an approximation of daily water use calculated by multiplying the number of employees by a subsector-specific gallons-per-employee-day coefficient (nationalized coefficients based on previous research by PMCL). These tabulations allowed for a review of approximated total water use by subsector as well as approximated water use per establishment by subsector.

A three-tiered list of priority subsectors for survey targets was jointly drafted by the CDM study team and SCVWD personnel during the August 2003 session. The CDM study team went on to differentiate between subsectors based on estimated similarities in the natures and magnitudes of water uses, going beyond the 3-digit NAICS-code level to the 4, 5 and 6-digit levels in some cases. The CDM study team also estimated the survey sizes needed to achieve results at various statistical confidence levels and found that achieving statistically significant results and covering a reasonable percentage of the largest water using subsectors in the District were competing objectives. Given the survey size constraint imposed by the reality of a limited budget, the CDM study team concluded that study resources would be best utilized by striking a balance between obtaining limited subsector-level detail of how water is being used among high water-using subsectors and attaining a higher level of understanding of those subsectors which will likely be targets for future water conservation programs. Taking this into consideration, a shorter list of priority survey targets was generated and incorporated into a set of three practical survey target options.

After the three options for targeting priority subsectors were presented to SCVWD personnel by the CDM study team, one option was agreed upon to be optimal in terms of generating both relatively comprehensive and applicable results. Presented in the September 2003 document entitled *Recommended Options for Survey Design for the Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study*, the three options were:

- Option 1 - Survey 6 priority subsectors accounting for an estimated 40 percent of the District's total water use;
- Option 2 - Survey 11 priority subsectors accounting for an estimated 44 percent of the District's total water use; and

- Option 3 - Survey 26 priority subsectors accounting for an estimated 61 percent of the District's total water use.

Option 2 to survey 11 subsectors was the option agreed upon by SCVWD and CDM. The original 200 total survey count was also expanded to 225. The cost of the extra 25 surveys was covered by a reallocation of duties associated with Subtask 4.2, as detailed in the May 2003 *Technical and Cost Proposal*. With the exception of office buildings, the target subsectors and their respective anticipated survey target counts are listed in Table 1 along with total numbers of establishments (according to the U.S. Bureau of Census County Business Patterns Database). There is no official estimate of the total number of office buildings in Santa Clara County.

TABLE 1
SURVEY TARGETS

Target Subsectors	Total Number of Establishments	Target Survey Counts
Office Buildings	*	25
Semiconductor and Other Electronic Component Mfg	479	25
Offices Of Physicians and Dentists	2365	23
Fabricated Metal Product Mfg.	716	22
General Medical and Surgical Hospitals	13	5
Food Mfg.	156	22
Hotels/Motels	226	22
Grocery Stores	335	22
Nursing Care Facilities	64	15
Wholesale Grocery and Related Products	190	22
Elementary and Secondary Schools	109	22
TOTALS	**4653**	**225**

* no estimate available

Target survey counts for each target subsector are based somewhat on the proportions to the total numbers of establishments in each subsector. With the exception of three of the subsectors, 1 percent to 14 percent of the total establishments in the subsectors are to be surveyed. This variability takes into account factors such as expectations of differences in water use among each subsector's establishments. In the case of general medical and surgical hospitals, a much higher percentage of total establishments are targeted for survey (nearly 40 percent of all establishments are to be surveyed). This is done in anticipation of high differences in water use among hospitals and to prevent a randomly selected anomalous hospital to dominate survey results. Nursing care facilities and schools are targeted for surveys at 23 percent and 20 percent of their total numbers of establishments, respectively, for similar reasons.

It is noteworthy that office buildings are aggregated together rather than differentiated by NAICS-coded subsectors. It is assumed that establishments located in office buildings that are not already included in other surveyed subsectors (e.g., doctors' offices) share similar water using characteristics and are most appropriately evaluated together as a single group.

B. Rationale for Survey Approach

As stated previously in the May 2003 *Technical and Cost Proposal*, surveying all CII establishments in the District would be cost-prohibitive. Regardless, surveying each establishment in a subsector is a highly inefficient means of generating a useful knowledge base about that subsector. Similarly, depending primarily on mail or telephone surveys to generate a useful knowledge base of nonresidential water use and conservation is undesirable because doing so limits the information that can be obtained. Due to the technical nature of some of the equipment/appliances/fixtures common among CII subsectors, onsite surveys such as those to be conducted by the CDM engineers employed in this study are needed to ensure accurate reporting. Furthermore, since physical measurements are major components of nonresidential indoor and outdoor surveys, field deployments are unavoidable.

The total of 225 onsite surveys was selected on the sole criterion of limited survey resources. This total number of surveys is not anticipated to allow for the reporting of many or any "statistically significant" results (i.e., the 95 percent or higher confidence level). Although inferences from the results of this study may ultimately have to be made in the application of the knowledge bases to which these results build or contribute, and although such inferences may not be statistically supported, *per se*, the survey approach of conducting 225 on-site surveys is optimal in terms of meeting the study's objectives: building a useful knowledge base about the water-using equipment/fixtures/appliances in key CII sectors and learning more about the nature of these uses.

Section 3
Implementation Plan

The following proposed implementation plan consists of descriptions of the A) sampling approach, B) survey design, C) surveyor training, D) pre-survey procedures, E) onsite survey procedures, F) quality assurance procedures and G) periodic reports.

A. Sampling approach

For all but one of the eleven subsectors, establishments to be scheduled for surveys will be selected by applying a random number generator value to the Dun and Bradstreet Million Dollar Database for Santa Clara County. This database includes all establishments with 20 or more employees or with $1 million or more in annual revenues and provides each establishment's name, address, telephone number and NAICS code.

Office buildings must be dealt with differently because the Dun and Bradstreet database only lists establishments, not structural aggregations of various separate establishments that share water-using equipment/fixtures/appliances. Also, the appropriate contact to accompany the surveyor on such an onsite visit would likely be the office-building superintendent or manager rather than any single resident establishment's contact person. As such, office buildings will be randomly selected from a real estate database of office building addresses accessible at http://www.officedirectory.com.

From the comprehensive listings of the potential survey targets, selections of establishments in each subsector for survey scheduling will be made randomly via application of a random numbers generator. These subsets of subsector establishments will include full contact information and will be grouped and then provided to the SCVWD announcement mailers and CDM appointment schedulers in staggered replicates in proportion to the numbers of total surveys that can potentially be completed in a weeklong period. Each establishment in the replicate will receive via mail an announcement regarding the program. Approximately one week subsequent to the mailing, each establishment in the replicate will receive a phone call from an appointment scheduler. If contact is not made, a message for a return call will be left. If after three business days subsequent to the initial call, contact is not made, a second call will be made and another message will be left if necessary. If contact is not made seven business days subsequent to the initial call, a final call will be made, but no message for a return call will be left.

Schedulers will keep a chronicle of contact, and this information will be incorporated into the final report's section on self-selection bias. Schedulers will attempt to arrange for survey appointments at the establishments' first available convenient time within thirty calendar days.

Mailers and schedulers are given establishment replicates so that announcement letter mailings can be minimized and so that scheduling efforts devoted to each establishment will be equal. Making scheduling efforts equal across all targeted establishments is done to avoid adding to any self-selection bias that may already be introduced into the survey results due to the voluntary nature of the establishment selection process.

B. Survey Design

The approach for the nonresidential water use survey includes the use of an indoor and an outdoor survey form, which will be completed by the surveyor during the on-site interview and inspection. The survey forms are shown in Annex A. In cases in which no water is used for outdoor purposes, only the indoor survey form will be completed.

Consistent with the objectives for the Baseline Study, the survey forms focus on:

- Situational characteristics of customers (e.g., business type, facility size, irrigable area, number of employees, etc.)
- Flow rates of easily accessible water fixtures
- Presence, types, and counts of water-using appliances and fixtures
- Conservation attitudes
- Other water-use characteristics

The survey form is designed to elicit responses that reveal "how" water is being used by the establishments in the targeted subsectors. This is in contrast to quantifying "how much" water is being used for varied purposes within the targeted subsectors, which would require many more extensive on-site investigations beyond the scope of this study.

C. Surveyor Training

For the Baseline Study, it is the goal of the CDM study team to ensure that the surveys are conducted in a consistent and professional manner. The CDM study team has prepared a reference manual that contains a compilation of common water-using appliances and equipment that may be encountered during the on-site surveys. The reference manual also contains recommended procedures for measuring specific on-site characteristics such as lot features and specific fixture flow-rates. The CDM team has completed a one-day working session with the District to review the draft implementation plan, the survey forms, the pre-survey procedures, the on-site survey procedures and the post-survey procedures.

D. Pre-Survey Procedures: Program Announcement Letters and Scheduling

A program announcement letter on SCVWD letterhead will be sent to each establishment targeted for survey scheduling (see Annex B). The intent of the program announcement letter is to introduce the nonresidential survey project to the targeted establishments and to introduce and give credibility to the CDM surveyors. Based upon past experience, the program announcement letter will not generally prompt establishments to call in and schedule the survey. Rather, the announcement is solely used to let the establishments know about the surveys and to make them aware that they will be subsequently contacted by a scheduler. Within the program announcement letter, specific contact information from both SCVWD and CDM will be provided so that targeted establishments can validate the program.

In approximately a one-week timeframe following the program announcement letter being mailed, follow-up phone calls by the CDM survey schedulers will be made to each of the targeted establishments in an attempt to schedule site surveys for the following week(s).

The CDM survey schedulers will use a script as a guide when making initial telephone contact with the targeted establishments and will complete a form subsequent to each contact that tracks the scheduling history (see Annex D). To preserve the randomness of the targeted sample as much as possible, each targeted establishment will be given an equal opportunity to become a participant in the survey. If during a telephone exchange a targeted establishment declines to participate in the survey, they will be removed from the target establishment list. However, if the designated or another appropriate contact person is not available during the initial telephone contact, the CDM survey scheduler will request a preferred time for follow-up contacts and then make two call-backs to targeted establishments in order to schedule an interview. Other scheduling protocols are described below.[1]

- During initial telephone contact, the targeted establishment will be prescreened with respect to type and location of establishment. That is, the CDM survey scheduler will confirm that the contacted establishment is, in fact, properly categorized in the targeted subsector and will verify its physical location.

- During the telephone contact, the schedulers will briefly explain the purpose of the survey, the nature of the questions they will be asking and the estimated time required to conduct the survey (1 hour in smaller establishments; 3 hours in larger facilities).

- Each targeted establishment will be contacted three times (as necessary) in order to secure a scheduled appointment

- During the telephone contact, the scheduler will request that the site survey be conducted in cooperation with those who can provide general business statistics as well as those familiar with and that have access to all of the facility's water-using fixtures and equipment. Note, though, that accessibility to outdoor equipment such as irrigation controllers will not be inquired about specifically during the scheduling telephone exchanges. Hence the absence of guaranteed access to such equipment will not be considered a criterion for scheduling a survey at any establishment. It is anticipated that surveyors' onsite guides will include:

  - Maintenance staff and property managers for office buildings;
  - Management and engineering staff for manufacturing;
  - Office managers for medical and dental offices;
  - Administrators and engineering/maintenance staff for hospitals and nursing homes;
  - Administrators and maintenance staff for schools; and
  - Managers and maintenance staff for hotels and motels.

- All appointments for site visits will be scheduled at the surveyed establishment's convenience.

- Appointments will be scheduled for specific arrival times. Survey participants will be contacted by phone if the surveyor anticipates being more than 15 minutes late.

[1] Scheduling protocols are derived from those employed in the East Bay Municipal Utility District Water Conservation and Baseline Study (1995) completed by Planning and Management Consultants, Ltd. (PMCL) and VOLT Information, Energy & Water Technologies (VIEWtech).

E. On-Site Survey Procedures[2]

The surveyor will have on hand the SCVWD letter of introduction and maintain in clear view appropriate CDM identification. The surveyors' dress will be professional but suitable to the nature of their work. It is understood that the surveyor is a representative of both CDM and the SCVWD and is expected to demonstrate a professional demeanor.

Upon arrival at the site location, the surveyor will begin by greeting the designated contact and writing their name, title and phone number on the survey form. If available, the surveyor will also obtain the contact's business card for CDM's files. The surveyor will then briefly explain the purpose of the survey and the nature of the questions that will be asked and measurements that will be made. If the surveyor senses any inordinate risk to their own person or to the establishment attributable to the survey, the surveyor should cancel the appointment and vacate the premises. Once deeming the survey process safe, the surveyor will acquire the signature of an establishment representative on the Hold Harmless Agreement and Customer Consent to Release Water Billing Records form provided in Annex E. The surveyor will then proceed to the general site inquiries for the indoor component of the survey. Some of these inquiries will be specific to a single subsector.

After the general inquiries, the surveyor will ask questions about conservation in general and about conservation through the utilization of recycled water. Questions covering the types and counts of water-using fixtures and appliances at the establishment will then be asked. General inquiries for the outdoor component of the survey (e.g., responsibilities for landscape maintenance) follow.

Upon completion of the verbal inquiries, the surveyor will ask to be shown around the establishment in order to collect more detailed information on all or a subset of water-using appliances and fixtures. For sites with a large number of fixtures and appliances, the goal will be to sample 10 percent of the fixtures and appliances at various locations in the establishment, with a limit of 10 fixtures per type.

Upon completion of the indoor survey, the surveyors will walk around the outside of the establishment and perform the measurement work associated with the outdoor portion of the survey. The surveyor will utilize the grid note page in the catch-can test section of the form and sketch the general area of the property. If the contact person does not know or is unsure of any of the lot characteristics (general query described above), the surveyor will make any and all necessary measurements. The surveyor should determine whether the total hardscape or landscapable area is the simplest to calculate. This will depend on the size and shape of the lot and the complexity of the landscaping. By calculating the total landscape area, the surveyor can determine the total hardscape; conversely, measuring the total hardscape will allow the surveyor to calculate the total landscape area. In either case, the surveyor will also take more detailed notes on the amount of turf and irrigated landscape. This method provides the best combination of accuracy and efficiency. As necessary, the surveyor will then walk around the property and collect additional pertinent data about:

[2] On-site survey procedures are derived from those employed in the East Bay Municipal Utility District Water Conservation and Baseline Study (1995) completed by Planning and Management Consultants, Ltd. (PMCL) and VOLT Information, Energy & Water Technologies (VIEWtech).

- Dimensions of the total lot
- Dimensions of sections of turf, irrigated landscaping, unirrigated landscaping, hardscape/building footprint
- Dimensions of swimming pools, spas, fountains
- Water pressure from hose bib in PSI

Surveyors will gather data about the types of irrigation systems (hoses, sprinklers, in-ground systems), sprinkler head types and information on any timers/controllers for the sprinkler systems.

In order to minimize the length of the survey and the inconvenience to the surveyor's escort, the standard method of operation for the surveyor will be to obtain all the necessary measurements (e.g., dimensions), then perform any necessary calculations (e.g., areas) after leaving the survey site.

As appropriate upon completion of the survey (and if the surveyor completed the outdoor survey unescorted), the surveyor will report back to the establishment's primary contact to indicate the survey's completion.

F. Quality Assurance Procedures[3]

Quality assurance will be an important component of the site surveys and will be comprised of 3 general components:

- Paperwork quality control: All paperwork (including scheduling logs and completed surveys) will be reviewed by CDM supervisors. A final check of the completed surveys will be completed prior to data entry.
- Ride-alongs: During the initial surveys in each targeted subsector, a CDM supervisor will accompany the surveyor(s) onto the site to ensure that they are comfortable with the required tasks. Ride-alongs by a CDM supervisor will also be conducted on a periodic basis. Also, SCVWD staff may request to participate in the surveys at any time.
- Follow-up questionnaire: Contact persons at each surveyed establishment will receive a follow-up mail survey inquiring about their satisfaction with the on-site survey process. See Annex C for the follow-up survey. This survey will be mailed by SCVWD within one week of the on-site survey.

G. Periodic Reporting

CDM will submit biweekly status reports to SCVWD that will detail work progress with the on-site surveys. The progress reports will include details on survey participation rates, survey backlogs, biweekly and project-to-date accomplishments, encountered problems and interim or final resolutions, results of the follow-up questionnaires, and work schedules for the next period.

[3] Quality assurance procedures are derived from those employed in the East Bay Municipal Utility District Water Conservation and Baseline Study (1995) completed by Planning and Management Consultants, Ltd. (PMCL) and VOLT Information, Energy & Water Technologies (VIEWtech).

Section 4
Data Analysis and Final Reporting

Standard descriptive statistics will be generated in the study for two general types of survey data: proportional and continuous. In instances in which an 80% or higher confidence level is obtained for a response or measurement for any given parameter, that confidence level will be reported as well. Along with these reports of results approaching conditional statistical significance will be explanations of the limitations of the predictive powers of these estimates. Finally, water use data for each survey establishment will be collected and utilized in the development of multiple regression models that can be used to evaluate the relative explanatory qualities of some of the key study parameters. In the event that SCVWD is interested in expeditiously adding to the knowledge base built in this study upon its completion, the CDM study team will provide consultation on the marginal efforts required to achieve the District's specified goals.

The following is a more detailed explanation of how the study results will be analyzed, reported and explained.

A. Survey Data Descriptive Statistics

Proportional data, such as fixture or equipment presence or absence responses and indications of positive or negative conservation attitudes, will be reported as percentages. Continuous data, such as counts on fixtures and equipment, students, hotel beds, etc., as well as most actual measurements, will be reported as means, medians, modes and standard deviations to two decimal places.

As stated previously, the total of 225 onsite surveys divided between the 11 subsectors was selected on the sole criterion of limited survey resources. This total number of surveys is not anticipated to allow for the reporting of many if any "statistically significant" results (i.e., the 95 percent or higher confidence level) for any of the subsectors. For results that can be reported with appropriate relative errors at or above the 80% confidence level, the confidence level as well as the relative error will be reported. Proportional data will already be reported in percentages, so relative errors will be calculated as margin of error values are calculated for continuous data. Margin of error values for continuous data will be reported in relative error form (plus or minus some percent around the value).

B. Recommendations for Additional Surveying

Some results for parameters in this study will be more critical than others in terms of applying the knowledge to critical future resource allocation decisions. There will also likely be study parameters for which minimal marginal surveying efforts will deliver survey results that will in fact be conditionally statistically significant. Subsequent to the final reporting process in this study, recommendations for optimizing future surveying resources can be made in instances where high returns for more confident estimates can be gained at little additional costs. Such determinations, however, cannot be made until this initial study is complete.

C. Collection of Water Use Data

Historical water-use records from the surveyed establishments will be collected from the 13 water retailers' billing records by SCVWD under the direction of the CDM study team. Upon completion of the site surveys, the CDM study team will compile lists of customer names and service addresses

for those site survey participants who provide consent for access to their water billing records. SCVWD personnel will preferably sort these lists by zip code. In some cases, identification of water use accounts will require utilities to hand match surveyed locations with water use accounts to obtain the water billing histories. If a business establishment has multiple meters or multiple accounts, the identification of all water use accounts/meters associated with a given location will be necessary. For each site survey participant, selected customer account information could be requested from local retail water providers including (but not limited to):

- Account number and account name
- Service and mail address and phone numbers
- Customer class codes
- Number of meters
- Water meter reading dates and quantities for at least the most recent 12-month period

D. Development of Statistical Relationships

The data analysis will include an investigation of the options for the development of multiple regression water-use models for each subsector. Such models incorporate the results of on-site surveys with customer water billing data. Because the database generated from this study will contain both the level of water use (i.e., water billing data) and measurements of some the most likely determinants of water use (i.e., data obtained from the site surveys), water use models that measure the impact of specific explanatory variables are developable. The dependent variable in this type of model is typically derived from the water use data obtained from billing records, and the independent (or explanatory) variables are derived from information collected from the site surveys. The most appropriate and sound regression techniques will be used to ensure that the measured impact of the independent variables are the best, unbiased measures of the effects of these variables on water use occurring in the subsector survey samples.

Annex A

SANTA CLARA VALLEY WATER DISTRICT
NONRESIDENTIAL WATER USE AND CONSERVATION BASELINE SURVEY

CUSTOMER DATA

Survey Control Number (e.g., OB-01) _____

Customer name _____

Service address _____

City _____ Zip code _____ Phone number _____

Water retailer (DK=don't know) _____ Account number (DK) _____

Establishment Type:	Please √
OB - Office Building	
SC - Semiconductor/electronic component manufacturer	
PD - Office of physician or dentist	
FM - Fabricated metal product manufacturer	
MS - General medical/surgical hospital	
FP - Food product manufacturer	
HM - Hotel or motel	
GS - Grocery store	
NC - Nursing care facilities	
WG - Wholesale grocery/related products facility	
ES - Elementary/secondary school	

SURVEYOR DATA

Survey date _____ Time In _____ am/pm Time Out _____ am/pm

Surveyor name: _____

A complete outdoor survey to be conducted at this establishment? (i.e., including irrigation system inquiries and testing): _____ (N=no / Y=yes)

If outdoor survey will not be complete, explain:

_____

---

1. Name, title, and phone number of person assisting in the survey: (DK)

   Name: _____

   Title: _____

   Phone number: _____ Email: _____

2. Please briefly describe the services offered or goods produced at this establishment:

   _____

GENERAL SITE INQUIRIES

3. Year building structure originally built? (*DK*) _____ Yr.

4. Has there been any major remodeling of the original facilities? _____ N/Y/DK

   (IF YES), please describe _____

5. What is the approximate total square footage of the building(s) at this site? _____ (sq. ft.)

6. Annual average (including part-time) number of employees at this establishment (*DK*) _____ #

   6a. Does employment vary by season? _____ N/Y/DK

   6b. (IF YES) Seasonal average number of employees: (DK)

   Winter_____# Spring_____# Summer_____# Fall_____#

   6c. Days a week establishment is typically open for normal operation _____#

OFFICE BUILDINGS

7. Number of office units in building (DK) _____#

8. Average number of units occupied (over most recent 1-year period) (DK) _____#

   8a. Seasonal percentage of full occupancy (over most recent 1-year period): (DK)

   Winter_____% b. Spring_____% c. Summer_____% d. Fall_____%

HOTELS

9. Does the hotel have banquet/conference facilities? _____ N/Y/DK

   9a. If yes, what is the estimated total square footage of these facilities? (DK) _____sq. ft.

10. Number of beds (DK) _____#

11. Average guest occupancy rate (over most recent 1-year period) (DK) _____#

   11a. Seasonal percentage of full occupancy (over most recent 1-year period): (DK)

   Winter_____% b. Spring_____% c. Summer_____% d. Fall_____%

SCHOOLS

12. Maximum student capacity at site (DK) _____#

    12a. Grades taught at school (for example, K-5, 6-8, 9-12, K-12) _____grades

13. Average student occupancy rate (over most recent 1-year period) (DK) _____#

    13a. Seasonal percentage of maximum student capacity (over most recent 1-year period): (DK)

    Winter_____% b. Spring_____% c. Summer_____% d. Fall_____%

HOSPITALS/NURSING HOMES

14. Total number of beds (*DK*) _____ #

    14a. Total number of private restrooms (2 or fewer patients have access or an employee-only restroom) (DK) _____ #

    14b. Total number of common-access restrooms (>2 patients have access) (DK) _____ #

15. Average number of in-patient visits per day (over most recent 1-year period) (DK) _____ #

16. Average overnight/residential patient occupancy rate (over most recent 1-year period) (DK) _____#

    16a. Seasonal percentage of full bed occupancy (over most recent 1-year period): (DK)

    Winter_____% b. Spring_____% c. Summer_____% d. Fall_____%

PHYSICIANS'/DENTISTS' OFFICES

17. Average number of patient visits per day (over most recent 1-year period) (*DK*) _____ #

GENERAL CONSERVATION PERCEPTIONS

18. On a scale from 1 to 5 (where 1 is least likely, 5 is most likely, and N/A is not applicable) how likely would your establishment be to participate in a water conservation program targeting increases in water use efficiency in:

a. Plumbing fixtures for domestic uses (toilets, showers, faucets) _____(1-5)
b. Cooling and heating units _____ (1-5)
c. Water-using product manufacturing _____ (1-5)
d. Landscaping _____ (1-5)
e. Kitchen processes and equipment _____ (1-5)
f. Laundry processes and equipment _____ (1-5)

19. On a scale from 1 to 5 (where 1 is least likely, 5 is most likely, and NA is not applicable), how likely would your establishment be interested in participating in a:

a. Full-scale facility audit prescribing operational changes in indoor water-using processes and equipment (e.g., leak inspections, equipment changes) with estimated costs and benefits _____ (1-5)

b. Full-scale facility landscape audit prescribing operational changes in outdoor water-using processes and equipment (e.g., leak inspections, equipment changes) with estimated costs and benefits _____ (1-5)

c. Toilet replacement rebate program that provides financial incentives to replace lower efficiency toilets _____ (1-5)

d. Program to incorporate utility-provided recycled water for indoor uses _____ (1.5)

e. Program to incorporate utility-provided recycled water for outdoor uses _____ (1-5)

f. Water efficient equipment and appliance rebate programs that provide financial incentives to replace lower efficiency equipment _____ (1-5)

g. Water agency sponsored workshops on water efficiency opportunities _____ (1-5)

h. Educational programs on water efficiency products and opportunities _____ (1-5)

i. Community effort to institute a drought-tolerant landscape ordinance

1. with grandfathering for existing establishments _____ (1-5)
2. with no grandfathering for existing establishments _____ (1-5)

j. Voluntary program which promotes the conversion of existing landscaping to drought-tolerant landscaping

1. supported by grants for all establishments _____ (1-5)
2. supported by loans for all establishments _____ (1-5)
3. with no financial support for establishments _____ (1-5)

20. On a scale from 1 to 5 (where 1 is least important and 5 is most important), how would you rate the following as incentives to conserve water:

a. Save money _____ (1-5)
b. Protect environment _____ (1-5)
c. Prevent future water shortages _____ (1-5)
d. Other, specify_____ _____ (1-5)

21. On a scale from 1 to 5 (where 1 is least important and 5 is most important), to what extent has the following media contributed to your awareness of new water conservation opportunities?

a. Newspaper stories or advertisements _____ (1-5)
b. Radio advertisements or programs _____ (1-5)
c. Television advertisements or programs _____ (1-5)
d. Internet-based research _____ (1-5)
e. Word-of-mouth via other water professionals _____ (1-5)
f. Direct business solicitation by private firms (e.g., landscape architects) _____ (1-5)
g. Professional periodicals _____ (1-5)
h. Professional conferences _____ (1-5)
i. Information and/or consultation provided by the SCVWD _____ (1-5)

WATER SOURCE INQUIRIES

22. How would you best define in a phrase “recycled water”? (<10 words)_____

22a. Are you aware that in parts of Santa Clara County, recycled water from the water service provider is made available to establishments through separate service lines?_____ __N/Y/DK

23. What sources of water does this facility use (circle N/Y/DK as they apply)?

Utility-provided potable water	Y	N	DK
Utility-provided recycled water	Y	N	DK
On-site recycled water	Y	N	DK
Private well for potable uses	Y	N	DK
Private well for landscape or other uses	Y	N	DK
Private surface water source (ponds)	Y	N	DK
Other, specify _____	Y	N	DK

23a. (If YES to utility-provided recycled water) For what purpose(s) is this utility-provided recycled water used?
_____

23b. (If YES to on-site recycled water) What type of water is being recycled (i.e., From what process or water use was the water originally used)?
_____

23c. (If YES to on-site recycled water) For what purpose is this on-site recycled water used?
_____

23d. (If YES to any recycled water) What is your *primary* reason for using this recycled water (circle N/Y as they apply, but circle only one Y)?

Save money	Y	N
Protect environment	Y	N
Prevent future water shortages	Y	N
Other, specify_____	Y	N

23e. (If NO to utility-provided recycled water) What is the *primary* reason for its nonuse? (circle N/Y as they apply, but circle only one Y)?

No service connections to this facility	Y	N
Rates are too high	Y	N
Water quality is too poor	Y	N
Requires costly equipment changes	Y	N
Other, specify_____	Y	N

24. If you know your facility does not currently have access to service connections for utility-provided recycled water, would you use this type of water if it were made available to you? _____N/Y/DK

25. If your facility does have access to utility-provided recycled water but chooses not to use it, and there were a severe drought or water shortage in Santa Clara County, would you be more likely to use it?
_____N/Y/DK/NA

PLEASE NOTE IF THE ESTABLISHMENT HAS ANY OF THE SPECIFIED WATER USES/APPLIANCES LISTED BELOW; NOTE QUANTITY OF UNITS.		
Type of Water Use/Appliance	*No=N Yes=Y DK*	(IF YES) Specify Number of Units; *DK*
26. Domestic/sanitary use (drinking fountains, rest rooms, etc.)		
26a. For employee use		
26b. For customer/student/patient/public use		
26c. Restrooms		
26d. Toilets		
26e. Urinals		
26e.1. Waterless urinals		
26f. Showers		
26g. Restroom faucets		
26h. Drinking fountains (not bottled water)		
27. Facility cooling and heating		
27a. Cooling towers		
27a.1. Evaporative cooling tower with blowdown (conductivity meter controlled)		
27a.2. Evaporative cooling tower with conventional chemical treatment		
27a.3. Evaporative cooling tower with air heat exchange		
27b. Evaporative coolers		
27c. Air washers		
27d. Humidifiers		
27e. Boilers		
27f. Hydronic hot water heating		
27g. Circulating hot water heating		
27h. Steam heating		
28. Once-through cooling		
28a. Air conditioners		
28b. Air compressors		
29. Laundry		
29a. Commercial washing machines		
29b. Self-service washing machines (*for customers/student/public use*)		
30. Kitchen facilities (*specify # of kitchens*)		
30a. Dishwashing machines		
30b. Kitchen faucets		
30c. Pre-rinse sprayers		
30c.1. High-flow pre-rinse sprayer *(Fisher and blue)*		
30c.2. Low-flow pre-rinse sprayer *(Fisher and blue)*		
30d. Food steamers		
30e. Garbage disposers		
30f. Water-cooled refrigeration		

PLEASE NOTE IF THE ESTABLISHMENT HAS ANY OF THE SPECIFIED WATER USES/APPLIANCES LISTED BELOW; NOTE QUANTITY OF UNITS.		
Type of Water Use/Appliance	*No=N* *Yes=Y* *DK*	(IF YES) Specify Number of Units; *DK*
31. Ice-making machines		
31a. Water-cooled icemaking machines		
31b. Air-cooled icemaking machines		
32. Washing and sanitation		
32a. General facility washdown and clean-up		
32b. Sterilization equipment / autoclaves (*primarily hospitals*)		
32c. Vehicle washes		
32d. Utility (general cleaning) faucets		
32e. Water-based sweeping equipment		
33. Maintenance shops		
33a. Maintenance area faucets		
34. Laboratories		
34a. Laboratory faucets		
35. Process water for product manufacturing		
35a. Process water as part of the product		
35b. Water to convey product		
35c. Product (e.g., food, silicon wafers, etc.) rinsing units		
35d. Milling, drilling, or cutting fluids		
35e. Chemical mixing		
35f. Manufacturing equipment cooling		
36. Process water purification equipment		
36a. Water softeners		
36b. Water filters		
36c. Reverse osmosis units		
36d. Deionization/ion exchange units		
36e. Sediment filtration		
36f. Activated carbon filtration		
36g. Ultra pure water used		
37. Wastewater pretreatment equipment		
38. Miscellaneous water use		
38a. Photographic / X-ray processing (*primarily hospitals*)		
38b. Dialysis units (*primarily hospitals*)		
38c. Liquid gas vaporizers		
38d. Fume/gas scrubbers		
38e. Liquid ring vacuum pumps (*primarily medical/dental facilities*)		
39. Landscape uses		
40. Water features		
40a. Swimming pools (*including rehab pools in hospitals*)		
40b. Jacuzzis/Spas		
40c. Fountains		
41. Pressure regulators off the incoming line for indoor water uses		
42. Pressure regulators off the incoming line for outdoor uses		

43. Does this facility have separate water meters for specific purposes of water use? _____ N/Y/DK

43a. (IF YES), please specify

_____

44. Is there any other indoor water-using equipment employed at this facility or water use at this facility that has not been addressed so far in this survey? _____N/Y/DK

44a. (IF YES), please specify

_____

45. For a sample of gravity flush toilets, list: **[*Goal is a minimum 10% sample in various locations (up to 10 toilets)*]**								
Gravity Flush Toilet #	Mount *Wall=1 Floor=2*	Location: *Private =1 Common area=2*	Make (*not available =NA*)	Year Manuf. (*DK*)	Gallons per flush *(DK)*	Displacement Device *(N/Y/DK)*	Infrared Devices (N/Y/DK)	Leaks *(N/Y/DK)*

Year manufactured determination, gallons per flush determination, and random sampling methodology:

46. For a sample of pressure assisted flush toilets, list: **[*Goal is a minimum 10% sample in various locations (up to 10 toilets)*]**								
Pressure Assisted Flush Toilet #	Mount *Wall=1 Floor=2*	Location *Private =1 Common area=2*	Make (*not available =NA*)	Year Manuf. (*DK*)	Gallons per flush *(DK)*	Displacement Device *(N/Y/DK)*	Infrared Devices (N/Y/DK)	Leaks *(N/Y/DK)*
.								

Year manufactured determination, gallons per flush determination, and random sampling methodology:

47. For a sample of any other types of toilets, list: **[*Goal is a minimum 10% sample in various locations (up to 10 toilets)*]**								
Other Type Toilet #	Mount *Wall=1 Floor=2*	Location *Private =1 Common area=2*	Make (*not available =NA*)	Year Manuf. (*DK*)	Gallons per flush *(DK)*	Displacement Device *(N/Y/DK)*	Infrared Devices (N/Y/DK)	Leaks *(N/Y/DK)*
.								

Toilet type:_____

Year manufactured determination, gallons per flush determination, and random sampling methodology:

48. For a sample of urinals, list: **[*Goal is minimum 10% sample in various locations (up to 10 urinals)]***				
Urinal #	Location *Private=1 Common area=2*	Gallons per flush (*DK*)	Infrared Devices (N/Y/DK)	Leaks *(N/Y/DK)*

Gallons per flush determination and random sampling methodology:

49. For a sample of faucets, list:
[*Goal is minimum 10% sample in various locations (up to 10 faucets)]*

Faucet #	Location *Private=1 Common area=2*	Faucet type *(Kitchen=1, bathroom=2, utility=3, other=4; DK)*	Gallons per minute (*DK)*	Aerator attached *(N/Y/DK)*	Infrared Devices (N/Y/DK)	Leaks *(N/Y/DK)*

Gallons per minute determination and random sampling methodology:

50. For a sample of shower stalls, list:
[*Goal is a minimum 10%sample in various locations (up to 10 shower stalls)*

Shower Stall #	Showerhead #	Gallons per minute (*DK*)	Showerhead type: atomizing=1 stream/spray=2 (*DK*)	Showerhead type: fixed=1 handheld=2 (*DK*)	Showerhead shut-off button *(N/Y/DK)*	Leaks *(N/Y/DK)*

Gallons per minute determination and random sampling methodology:

51. For each dishwasher, list					
Dishwasher #	Energy Star *(N/Y/DK)*	Manufacturer/Make/Model *(DK)*	Dishwasher type *Stationary rack=1 Conveyor type=2 Other(Specify)=3 (DK)*	Rinse *Water=1 Chemical=2 (DK)*	Incoming pressure regulator: *(N/Y/DK)*

52. For each clothes washer, list					
Washing machine #	Manufacturer/Make/Model *(DK)*	Washer type *Top-loading=1 Front-loading=2*	Capacity in pounds of material (*DK*)	Number of cycles *(DK)*	Water saving/load size selection feature: *(N/Y/DK)*
Capacity determination methodology:					

53. For each garbage disposer, list		
Disposer #	Manufacturer/Make/Model *(DK)*	Disposer type *Disposer=1 Scrapper/disposer=2 Conveyor/disposer=3 (DK)*

54. If indoor swimming pool, list					
Swimming pool #	Leaks *(N/Y/DK)*	Length (feet) *(DK)*	Width (feet) *(DK)*	Avg. Depth (feet) *(DK)*	Pool cover *(N/Y/DK)*

55. If indoor spas/jacuzzis, list					
Spa #	Leaks *(N/Y/DK)*	Length (feet) *(DK)*	Width (feet) *(DK)*	Avg. Depth (feet) *(DK)*	Spa cover *(N/Y/DK)*

56. Water pressure at the highest available indoor fixture (if more than one building floor)? *(DK)* _____PSI

OUTDOOR WATER SURVEY

1. Name, title, affiliation, phone number, and email of person assisting in the outdoor portion of the survey (NAS = no assistance)

   Name: _____

   Title: _____

   Affiliation: _____

   Phone number: _____email: _____

2. Name, title, affiliation, phone number, and email of person primarily responsible for maintaining landscaped areas (DK) (NLA=no landscapable area):

   Name: _____

   Title: _____

   Affiliation: _____

   Phone number: _____email: _____

3. Lot size of this location (sq. feet) (NAC = not accessible) _____ sq. ft./NAC

4. Square footage of hardscape (including building footprint, driveway, decks, paths, patios, etc.) _____ sq. ft./NAC

5. Square footage of landscapable areas (If none, enter 0) _____ sq. ft./NAC

   [NOTE THAT HARDSCAPE AREA PLUS LANDSCAPABLE AREA SHOULD EQUAL THE LOT SIZE.]

6. Square footage of landscapable area that is irrigated (If none, enter 0) _____ sq. ft./NAC/DK

7. Square footage of turf (lawn) area _____ sq. ft./NAC/NTA

IRRIGATION SYSTEMS

8. Landscaping irrigated? _____ N/Y/DK/NLA

9. Irrigation system
   a. Automatic in-ground _____ N/Y/DK
   b. Manual in-ground _____ N/Y/DK
   c. Automatic drip _____ N/Y/DK
   d. Manual drip _____ N/Y/DK
   e. Hose only _____ N/Y/DK
   f. Hose & sprinkler _____ N/Y/DK
   g. Hose & sprinker, with timer _____ N/Y/DK

[FOR AUTOMATIC SYSTEM ONLY]

10. How many irrigation system controllers? (DK) (If none, enter 0) _____ #

10a. Approximately how many times are controllers typically adjusted annually? (DK) _____#

11. If controllers, list									
Controller #	Manufacturer/Make /Model (*DK*)	Type of controller: *Mechanical=1; Digital=2; Other=3; DK*	No. of stations (*DK*)	No. of zones (DK)	Sprinkler types: Pop-up=1 Rotor=2; Impact=3; Bubbler=4; Drip=5 Microspray=6; Hose=7; Hose/sprinkler=8	Programmable multiple start time capabilities: *N/Y/DK*	Type of calendar clock: *7-day=1 14-day=2 30-day=3 other=4 DK*	Moisture/ rain sensor: *N/Y/DK*	ET Settings: *N/Y/DK*

12. If outdoor swimming pool, list					
Swimming pool #	Leaks *(N/Y/DK)*	Length (feet) *(DK)*	Width (feet) *(DK)*	Avg. Depth (feet) *(DK)*	Pool cover *(N/Y/DK)*

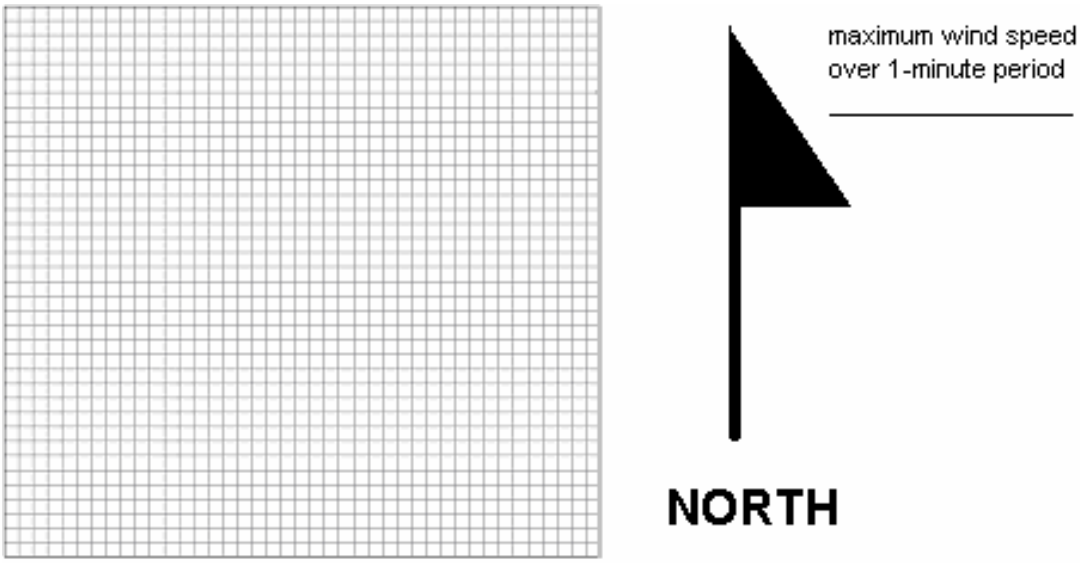
13. If outdoor spas/jacuzzis, list					
Spa #	Leaks *(N/Y/DK)*	Length (feet) *(DK)*	Width (feet) *(DK)*	Avg. Depth (feet) *(DK)*	Spa cover *(N/Y/DK)*

14. If fountain/pond, list					
Fountain/pond #	Leaks *(N/Y/DK)*	Length (feet) *(DK)*	Width (feet) *(DK)*	Avg. Depth (feet) *(DK)*	Recirculating *(N/Y/DK)*

CATCH-CAN TEST

If not completed, why? _____

Sketch in the building, hardscape, landscape, and turf areas below and indicate the location of each catch-can test performed (Test 1 and/or Test 2) as well as the locations and numbers of each test's can (1,2,3…).*



15. Catch-Can Test				
Test # (Test 1 or Test 1 & 2)	Sprinkler Type	Can Number	Run Time (mm:ss)	Can Volume (ml)

*** Employ 15-15-15 rule:** Do not test if wind > 15 knots. Water for 15 minutes. Randomly distribute 15 cans (in no more than two zones).

Annex B

Santa Clara Valley Water District

Date

Addressee

Dear Water Customer:

The Santa Clara Valley Water District (SCVWD) is the primary water resources agency for Santa Clara County, California. As the county's water wholesaler, the water district makes sure that there is enough clean, safe water for homes and businesses. The mission of the water district is to promote a healthy, safe and enhanced quality of living in Santa Clara County through watershed stewardship and comprehensive management of water resources in a practical, cost-effective and environmentally sensitive manner.

The SCVWD - in order to ensure future water supply reliability and planning for the future - is embarking upon a program that will allow the District to better understand how water is being used in its service area. To that end, we may be soliciting your input and assistance over the next several weeks with an important survey that we are conducting as a part of this program. This water survey program aims to determine the types of water-using appliances and fixtures that exist in the Water District's service area.

The SCVWD has hired CDM, Inc., a nationally recognized consulting engineering firm to conduct the water surveys. If you are selected as a potential establishment for survey via our random selection process, a CDM representative will attempt to schedule a visit with your establishment to examine your water-using equipment. If you are contacted and agree to the survey, we would prefer to conduct it with the assistance of your building manager or building engineer if possible, and the visit to your business would only take about two hours.

Your participation in this program would be voluntary and free of charge. If you do participate, we will recognize your contribution to the study, at your choosing, in a listing of participating establishments in our final report.

If you would like to find out more about this program in general, feel free to contact Ms. Shicha Chander at the water district at 408-265-2607, ext. 3114 or Ms. Alyson Watson at CDM, Inc. at 925-296-8060.

Sincerely,

HOSSEIN ASHKTORAB
Water Use Efficiency Unit Manager
SANTA CLARA VALLEY WATER DISTRICT

Annex C

Santa Clara Valley Water District

Date

Survey No.

Recipient and Address

On {date}, CDM, Inc. on behalf of the Santa Clara Valley Water District performed an on-site survey of water-using fixtures and appliances at your establishment. We want to take this opportunity to thank you for your participation in the water survey program and get feedback on your experience. In that regard, please take a few minutes and respond to the following questions:

1.	Was the surveyor on time?	Y / N
2.	Did the surveyor have visible identification?	Y/ N
3.	Was the surveyor courteous?	Y / N
4.	Did the surveyor seem to be knowledgeable?	Y / N
5.	Did the surveyor satisfactorily answer questions?	Y / N
6.	On a scale of 1 – 10 (1 being the lowest, 10 the highest), how would you rate the survey process overall?	_____

Any other comments regarding your experience with the water survey program would be greatly appreciated.

Thank you again for your assistance. Please return the completed survey form in the attached envelope.

Sincerely,

HOSSEIN ASHKTORAB
Water Use Efficiency Unit Manager
SANTA CLARA VALLEY WATER DISTRICT

Annex D

Survey Appointment Schedulers' Script for the SCVWD Nonresidential Water Use and Conservation Baseline Study

Hello, this is _____, calling on behalf of the Santa Clara Valley Water District. I am with Camp, Dresser, and McKee, the environmental consulting firm the Water District has contracted with to conduct their water use and conservation baseline survey of non-residential establishments in Santa Clara County. Your establishment is one we have randomly selected to participate in our survey. You may have received the announcement the Water District sent your organization several days ago.

<Pause and wait for a response>

If respondent is NOT ACCOMODA-TING (i.e., says the organization cannot participate or says the organization will only participate on some conditional basis other than scheduling convenience **I understand. Thank you for your time, and I apologize for any inconvenience this may have caused you.** *After hanging up, complete the entry for that call on the scheduling response form*	If respondent indicates NO AWARENESS OF THE ANNOUNCEMENT LETTER BUT INQUIRES about the survey **The water survey program is being conducted to determine the types of water-using appliances and fixtures that exist in the Santa Clara Valley Water District service area. Having a more accurate understanding of this information will allow the District to better accommodate the future water needs of Santa Clara County. If you agree to have your facility surveyed, the representative will visit your premises and examine your water-using equipment. The surveys will be used to learn more about this equipment and the nature of its use. We would prefer to conduct the water survey with your facilities manager or facilities engineer if possible. The visit to your premises should not take longer than 2 hours. Your participation in this program is voluntary and free of charge, and if you would like to validate its legitimacy, you can contact Ms. Shicha Chander at the Santa Clara Valley Water District's headquarters at 408-265-2607, ext. 3114. We assure you that any and all data we collect will be kept confidential and will be used solely for planning purposes. May we schedule an appointment for a survey with you at this time?** If response is YES, schedule an appointment within the next 30 days If response is MAYBE, contingent on supervisory approval or the need for additional time for consideration, or if the respondent has a question about the survey that you cannot answer, schedule a time to reinitiate contact within the next 3 days If response is NO **I understand. Thank you for your time, and I apologize for any inconvenience this may have caused you.** *After hanging up, complete the entry for that call on the scheduling response form*	If respondent indicates AWARENESS OF THE ANNOUNCEMENT LETTER AND IS ACCOMODATING (i.e., says the organization would like to participate) **May we schedule an appointment for a survey with your establishment at this time?** If response is YES, schedule an appointment within the next 30 days If response is MAYBE, contingent on supervisory approval or the need for additional time for consideration, or if the respondent has a question about the survey that you cannot answer, schedule a time to reinitiate contact within the next 3 days If respondent ASKS TO BE REFRESHED ABOUT THE CONTENTS OF THE LETTER **As the Water District explained in the announcement letter, the water survey program is being conducted to determine the types of water-using appliances and fixtures that exist in the Santa Clara Valley Water District service area. Having a more accurate understanding of this information will allow the District to better accommodate the future water needs of Santa Clara County. If you agree to have your facility surveyed, the representative will visit your premises and examine your water-using equipment. The surveys will be used to learn more about this equipment and the nature of its use. We would prefer to conduct the water survey with your facilities manager or facilities engineer if possible. The visit to your establishment should not take longer than 2 hours. Your participation in this program is voluntary and free of charge, and if you would like to validate its legitimacy, you can contact Ms. Shicha Chander at the Water District's headquarters at 408-265-2607, ext. 3114. We assure you that any and all data we collect will be kept confidential and will be used solely for planning purposes. May we schedule an appointment for a survey with your establishment at this time?** If response is YES, schedule an appointment within the next 30 days If response is MAYBE, contingent on supervisory approval or the need for additional time for consideration, or if the respondent has a question about the survey that you cannot answer, schedule a time to reinitiate contact within the next 3 days If response is NO **I understand. Thank you for your time, and I apologize for any inconvenience this may have caused you.** *After hanging up, complete the entry for that call on the scheduling response form*

Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study
Scheduling Response Form

Follow-up to announcement callback ☐ Initial call ☐ Follow-up after 1 message ☐ Follow-up after 2 messages ☐ Follow-up after conversation ☐

1. Establishment name and number called _____

2. Name and title of individual targeted _____

3. Date call initiated _____

4. Time call initiated _____ am pm

5. If no contact with target respondent, message left? (Y/N) _____

5. Name and title of individual contacted about scheduling _____

6. Response (a,b,c,d,e,f) _____

   a. NOT ACCOMODATING (NO)
   b. AWARENESS OF THE ANNOUNCEMENT LETTER – YES
   c. AWARENESS OF THE ANNOUNCEMENT LETTER – MAYBE
   d. NO AWARENESS OF THE ANNOUNCEMENT LETTER BUT INQUIRES – NO
   e. NO AWARENESS OF THE ANNOUNCEMENT LETTER BUT INQUIRES – YES
   f. NO AWARENESS OF THE ANNOUNCEMENT LETTER BUT INQUIRES – MAYBE

7. Special notes (e.g., comments about call, scheduling notes, directions, alternative contact numbers, etc.)
   Make a note here if participating establishment will be mailed a copy of the survey prior to the site visit.

Annex E

SCVWD Nonresidential Water Use and Conservation Baseline Study
Hold Harmless Agreement and Customer Consent to Release Water Billing Records

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Survey Control Number _____

This agreement 1) gives the CONTRACTOR (CDM, Inc.) and the DISTRICT (Santa Clara Valley Water District) permission to enter and to be on the CUSTOMER'S (surveyed establishment) property for the purpose of conducting a water survey, and 2) gives the DISTRICT and CONTRACTOR permission to access the CUSTOMER'S water billing records.

1. CUSTOMER agrees to defend, indemnify, protect and hold the DISTRICT and its participating water retailers, their agents, officers, and employees, and the CONTRACTOR harmless from and against any and all claims or liability for injuries or damages to any person or property which arise from or are connected with or are caused or claimed to be caused by the acts or omissions of the CUSTOMER or from conditions on the CUSTOMER'S property; provided, however that the CUSTOMER'S duty to indemnify and hold harmless shall not include any claims or liability arising from the established sole negligence or willful misconduct of the DISTRICT, their agents, officers, or employees, or the CONTRACTOR in performing the work or services or supplying materials to the CUSTOMER.

□ I agree

2. CUSTOMER authorizes its water utility to provide to the DISTRICT and to the CONTRACTOR the CUSTOMER'S water consumption history (including meter reading dates and water consumption histories) for all customer accounts associated with this service location. CUSTOMER understands that this information will be used in conjunction with water consumption histories for other accounts and will be used to conduct a statistical analysis of water use patterns for similar establishments in Santa Clara County but will not be shared with any other parties or shared for any other purpose.

□ I agree

Name and title of representative for CUSTOMER _____

Service address _____

City _____ Zip code _____ Phone number _____

Name of retail water provider: _____

Account number(s), if available: _____

Signature: _____

Date: _____

Appendix B
Study Design Features and Implementation Results

Appendix B
Study Design Features and Implementation Results

The following provides a discussion of the final study design approach and the results of the implementation of the field surveys.

B.1 Study Design

In order to better understand the potential implications of various study approaches, the following methodologies were employed by the study team in order to investigate the various options for the study design:[1]

- Compiled list of Commercial, Institutional and Industrial (CII) establishments and associated employee counts in Santa Clara County sorted by the NAICS codes. (North American Industry Classification System published by the Federal government's Office of Management and Budget provides a detailed classification system for all types of business and industry; see http://www.census.gov/epcd/www/naics.html). Employment and establishment counts for Santa Clara County were obtained by the NAICS from the U.S. Bureau of Census County Business Patterns database.

- Assigned gallons per employee per day (ged) estimates to each major NAICS category. These ged values are derived from samples of nonresidential establishments throughout the U.S. (Planning and Management Consultants, Ltd. (PMCL), 1996). The ged values were multiplied by the number of employees in each NAICS category to determine an approximation of water use in that category in the Santa Clara Valley Water District (District). These values have not been validated with any water use data from the District and/or its retail water purveyors, therefore, at best they represent an *approximation* of these subsectors' nonresidential water use and the total nonresidential water use in the District.

- Sorted NAICS categories by estimated gallons per day and gallons per establishment per day. Presented information to the District highlighting the County's largest water-using subsectors.

- Compiled list of primary, secondary, and tertiary priority targets in consultation with the District based in part on water use and in part on specific items of interest to the District. Refined some of the primary priority targets based on anticipated water use similarities. Each modified subsector is listed with a description of its NAICS classification and its gallons per day and gallons per establishment per day estimates.

- Estimated sample sizes needed to produce generally conservative margins of errors around means and proportions at the statistically significant level (95 percent confidence level) and at the 90 percent and 80 percent confidence levels for a set of survey inquiries for two of the previously identified primary priority target subsectors (hotels/motels and office buildings).

[1] See Recommended Options for Survey Design for the Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study, September 2003.

- Generated a proposed list of survey sizes for priority subsector targets. Minimum sample sizes are not based on estimated confidence-level calculations.

Upon consultation with the District it was determined that the District would be best served by the acquisition of practicable information on a subset of major water-using subsectors in the District, as opposed to pursuing statistically significant results for most parameters across some other subset of nonresidential (CII) subsectors. The District was presented with a number of options:

- Survey 6 subsectors with generally 40 on-site surveys per subsector
- Survey 11 subsectors with generally 20 on-site surveys per subsector
- Survey 26 subsectors with a total of approximately 425 on-site surveys (would require additional budget)
- Survey 6 to 26 subsectors on-site and an additional 5,000 nonresidential establishments by mail

Upon consultation with the District it was determined that the District would be best served by the acquisition of practicable information through on-site surveys of a subset of major water-using subsectors in the District. The District was presented with a number of options that included varied number of subsectors and varied number of surveys per subsector. Upon investigation with the District of the various trade-off's associated with targeting multiple CII subsectors and the impact on sample size, the District chose to target 11 subsectors with about 20 on-site surveys per subsector. The total number of target surveys was 225.

Based upon preliminary analyses of the types of business establishments in the District, their likely contributions to overall CII water use in the District, and their potential for participating in water efficiency program initiatives, the District chose to target the 11 subsectors shown in Table B-1. Preliminary analyses indicated that these 11 subsectors could potentially account for approximately 40 percent of total CII water demand in Santa Clara County.

TABLE B-1
SURVEY TARGETS

Target Subsectors	Total Number of Establishments*	Target Survey Counts
Office Buildings	Unknown	25
Semiconductor and Other Electronic Component Mfg.	479	25
Offices of Physicians and Dentists	2,365	23
Fabricated Metal Product Mfg.	716	22
General Medical and Surgical Hospitals	13	5
Food Product Mfg.	156	22
Hotels/Motels	226	22
Grocery Stores	335	22
Nursing Care Facilities	64	15
Wholesale Grocery and Related Products Facilities	190	22
Elementary and Secondary Schools	109	22
TOTAL	**4,653**	**225**

* Information obtained from U.S. Bureau of Census, County Business Patterns.

The goal was that approximately 20 site surveys would be completed for 9 of the 11 subsectors, with slightly less surveys for nursing care facilities (because of the lower number of existing establishments) and for hospitals (accounting for about half of the existing hospitals). It was expected that with the completion of these surveys, useful approximations of proportions of water-using fixtures, appliances, and equipment could be obtained for these subsectors as well as means and standard deviations of fixture/appliance counts. However, the range of establishments per subsector surveyed in this option would not provide opportunities to achieve higher confidence levels with subsamples within each subsector (i.e., small vs. large, or geographic differences). It was deemed that the selected option be considered as a *pilot* study of the identified subectors, upon which if more specific information is desired or required for specific parameters, or if actual statistical significance (95 percent confidence level) is sought for a specific purpose, there will be a much better basis for determining the type of information that would need to be collected and the sample sizes that would be required.

With the exception of office buildings, the target subsectors and their respective anticipated survey target counts are listed in Table B-1 along with the estimated number of establishments in Santa Clara County (according to the U.S. Bureau of Census County Business Patterns). There is no official estimate of the total number of office buildings in Santa Clara County.

Target survey counts for each target subsector were based somewhat on the proportions to the total numbers of establishments in each subsector. With the exception of three of the subsectors, 1 percent to 14 percent of the total establishments in the subsectors are to be surveyed. This variability takes into account factors such as expectations of differences in water use among each subsector's establishments. In the case of general medical and surgical hospitals, a much higher percentage of total establishments are targeted for survey (nearly 40 percent of all establishments are to be surveyed). This was done in anticipation of high differences in water use among hospitals and to prevent a randomly selected anomalous hospital to dominate survey results. Nursing care facilities and schools are targeted for surveys at 23 percent and 20 percent of their total numbers of establishments, respectively, for similar reasons.

It is noteworthy that office buildings are aggregated together rather than differentiated by the NAICS-coded subsectors. It is assumed that establishments located in office buildings that are not already included in other surveyed subsectors (e.g., doctors' offices) share similar water using characteristics and are most appropriately evaluated together as a single group.

B.2 Study Implementation

Upon agreement of the study design, the study team developed an implementation plan with the following components:[2]

- Sampling approach
- Survey design
- Surveyor training
- Pre-survey procedures: program announcement letters and scheduling
- On-site survey procedures
- Quality assurance procedures

[2] See Implementation Plan for the Santa Clara Valley Water District Nonresidential Water Use and Conservation Baseline Study, January 23, 2004. (Shown in Appendix A of this Final Report.)

- Periodic reporting
- Data analysis and reporting

The following sections highlight specific aspects of the survey implementation.

B.2.1 Sampling Approach

Two databases were drawn from to produce random sequenced lists of establishments for survey scheduling: the Dun & Bradstreet Million Dollar Database (State Slice of California) and the online office building directory at http://www.officedirectory.com (searched for *San Jose, CA PMSA*).

The Dun & Bradstreet database was searched for establishments in Santa Clara County that engage primarily in activities associated with the subsectors and corresponding NAICS categories shown in Table B-2. Establishments that engage only secondarily in these activities were not included in the search. Also shown in Table B-2 are the numbers of establishments these database searches produced.

TABLE B-2
SAMPLING APPROACH

Subsectors	NAICS Code Ranges	Number of Results
Office Buildings	NA	267
Semiconductor & Other Electronic Component Mfg.	334411-334419	486
Offices of Dentists	621210	28
Offices of Physicians	621111	79
Fabricated Metal Product Mfg.	332111-332999	254
General Medical and Surgical Hospitals	622110	17
Food Product Mfg.	311111-311999	43
Hotels/Motels	721110	68
Grocery Stores	445110	148
Nursing Care Facilities	623110	33
Wholesale Grocery and Related Products Facilities	422410-422490	92
Elementary and Secondary Schools	611110	249
TOTAL	**N/A**	**1,764**

The OfficeDirectory.com database search produced a list of 267 office building addresses in the greater San Jose metropolitan area, which corresponds with Santa Clara County in entirety, but also includes parts of Palo Alto and East Palo Alto. Two of the 267 files were thus eliminated from the lists of establishments to be randomized for survey scheduling due to the fact that both were determined not to be in Santa Clara County. It should be noted that the 265 addresses that were randomized and ordered for survey scheduling are not necessarily unique office building addresses, but rather unique office rental unit addresses.

B.2.2 Survey Design

The approach for the CII water use survey included the use of an indoor and an outdoor survey form, which was completed by the surveyor during the on-site interview and inspection. The survey form is shown in Appendix A of this Final Report. In cases in which no water is used for outdoor purposes, only the indoor survey form was completed.

The survey form was designed to elicit responses that reveal *how* water is being used by the establishments in the targeted subsectors. This is in contrast to quantifying *how much* water is being used for varied purposes within the targeted subsectors, which would require many more extensive on-site investigations beyond the scope of this study. Table B-3 highlights the various types of information that were targeted in the data collection of the site surveys. See Appendix A for the final survey instrument.

TABLE B-3
SURVEY MEASUREMENTS

General Site Characteristics ▪ Age of building structure ▪ Building(s) square footage ▪ Employment ▪ Subsector-specific data (number of students, number of beds, number of patients)	General Conservation Perceptions ▪ Potential conservation program participation ▪ Ratings of alternative conservation programs ▪ Ratings on conservation incentives ▪ Ratings on conservation information sources
Water Source Inquiries ▪ Type of water sources ▪ Reasons for recycled water use ▪ Reasons for no recycled water use	Water Use Types/Fixture Counts ▪ Sanitary ▪ Facility cooling/heating ▪ Laundry ▪ Kitchen ▪ Special purpose uses ▪ Landscape
Appliance/Fixture Testing ▪ Toilets ▪ Urinals ▪ Faucets ▪ Showers ▪ Dishwashers ▪ Clothes washers ▪ Garbage disposals ▪ Pools/spas	Outdoor Characteristics ▪ Lot size, hardscape, landscape, turf areas ▪ Irrigation systems ▪ Controller data ▪ Outdoor pools, spas ▪ Fountains ▪ Distribution system uniformity and precipitation rate

B.3 Site Survey Implementation

With the approved *Implementation Plan*, the field survey team initiated field operations during the week of January 19, 2004. The field surveys continued for 20 weeks and the following is a breakdown of surveys completed during 10 biweekly periods:

Survey initiation to 1/30/04:	4 surveys completed
2/2/04 to 2/13/04:	30 surveys completed (15.5 per week)
2/16/04 to 2/27/04:	23 surveys completed (11.5 per week)
3/1/04 to 3/12/04:	33 surveys completed (16.5 per week)
3/15/04 to 3/26/04:	38 surveys completed (19 per week)
3/29/04 to 4/09/04:	46 surveys completed (23 per week)
4/12/04 to 4/23/04:	25 surveys completed (12.5 per week)
4/26/04 to 5/07/04:	19 surveys completed (9.5 per week)
5/10/04 to 5/21/04:	1 survey completed (0.5 per week)
5/24/04 to 6/04/04:	6 surveys completed (3 per week)

Of the 1,764 establishments potentially targeted for the surveys, program announcement letters were mailed to 774 establishments and scheduling contacts were made with 728 establishments. One hundred and eleven establishments refused participation outright, 10 establishments cancelled their appointments after scheduling, and 349 were retracted solicitations (initial contact made, but ultimately not scheduled). In total, 225 surveys were completed.

From the comprehensive listings of the potential survey targets, selections of establishments in each subsector for survey scheduling were made randomly via application of a random numbers generator. These subsets of subsector establishments included full contact information and were grouped and then provided to the District announcement mailers and study team appointment schedulers in staggered replicates in proportion to the numbers of total surveys that can potentially be completed in a weeklong period. Schedulers followed a set of procedures that included the mailing of an announcement letter (from the District), and initial/follow-up phone calls in attempts to schedule the site surveys. Successive attempts were made to schedule a listed establishment for a site survey.

B.3.1 Lessons Learned During Survey Implementation

The primary problem encountered was failure of establishment contacts to keep appointments. In many cases in which the contact person was present for the appointment, the contact person no longer provided as much time for assistance with the survey as he or she had initially committed. Shortening the length of time required to complete the survey could possibly increase the contact's willingness to participate fully and therefore improve the quality of the data obtained.

A general problem associated with survey implementation and scheduling was timing of surveys. Because there was such diversity in establishments visited, gauging the time required for each survey prior to arriving at the establishment was exceedingly difficult. As a result, the scheduler attempted to allow approximately two to three hours for completion of each survey, with an additional 30 to 45 minutes for travel time between sites, depending upon distance between establishments. However, in some instances, the small size of the establishment and lack of landscapable area resulted in the survey being completed in less than one hour. In other instances, factors including large lot size, high number of water-using fixtures, limited assistance in finding fixtures for measurement, and building sprawl, contributed to the surveys exceeding the allotted two to three hours. Where possible, the contact for the second appointment was called and the second survey postponed, allowing additional time for completion of the initial survey. However, in some cases, portions of the outdoor component of the first survey were not completed because its completion would have rendered the surveyor unable to keep the next scheduled survey appointment.

Another problem that arose in the surveying process was unwillingness of contact individuals to assist the surveyors in all aspects of the survey, primarily due to the survey length. In many cases, the surveyor was provided with a map and instructed to use the map to locate fixtures for measurement. This substantially increased the time associated with the surveys, as it can be difficult to navigate large buildings to find specific equipment.

There were several unique challenges associated with scheduling office building surveys as several calls were required. Office buildings were initially identified from a real estate database for Santa Clara County. For each targeted office building, the scheduler would first contact tenants within the office building to request information on the management company responsible for the building. If this information was obtained, it was added to a database of management companies to be mailed

announcement letters. The information obtained in this manner proved to be incorrect in many instances, and therefore the office building surveys could not be scheduled. In many cases the property management contact information could not be obtained, as the establishments within the building either were unwilling or unable to provide the information.

Successfully scheduling the office building surveys was quite difficult even once the appropriate property manger was contacted. In the majority of the cases the property manager was not located at the office building to be surveyed. Arranging a specific time to meet the property manager at the site was problematic; this is in contrast to the other subsectors where, in most cases, the person leading the survey worked at the location to be surveyed. Many office buildings also contain multiple businesses with separate kitchen facilities, requiring that the property managers obtain permission from the tenants to allow the field survey team access to the kitchen facilities for flow rate measurements and equipment inspection. Due to the large degree of effort required on the property manager's part, management companies were reluctant to schedule the surveys.

In approximately 25 to 30 percent of the scheduled office building surveys the building contact failed to appear. The reasons given for not appearing were numerous, but the primary reason was the inconvenience for the contacts to disrupt their day and drive to a location separate from their place of work to participate in the survey. This resulted in the need to either try to reschedule with this person, or more frequently, attempt to locate additional survey candidates. One hundred seventy office buildings were pursued and 19 surveys scheduled, for an effective scheduling rate of only 11 percent. (Surveys performed in other subsectors were subsequently reclassified as office buildings based upon their facility characteristics, see Section B. 3.3.)

The office building subsector was clearly the most heterogeneous of all the subsectors surveyed because no single type of operation occurred within the office building group. Office buildings surveyed included large building complexes housing multiple tenants, as well as single, stand-alone structures occupied by one business establishment. Attempts were made to identify stand-alone office buildings in which office-related business was conducted when possible to provide for a greater consistency of the type of establishment within the subsector. However, as identified above in the description of the scheduling process, arranging for office building surveys was problematic without trying to target a subset of the subsector. Business conducted within office buildings ranged from semiconductor design and testing, to market research, and even police activities. The water use associated with these widely varying functions can be described as heterogeneous at best. Further, office buildings ranged from multi-story structures to office parks, with wide variety in landscaping characteristics.

Outdoor surveys were attempted at all survey sites. It should be noted, however, that in a substantive number of cases, full outdoor surveys were not completed for a variety of reasons including: lack of access, landscape contractor not available, no landscaping, no escorts/landlord not available, shared facilities, no irrigation systems, landscapers working on property, landscaping not managed by the facility, or rainfall on the date of the survey. The primary difficulty was obtaining any information on the irrigation systems and performing catch can tests. Measurements of lot sizes and percent landscape was information sought and collected for many of the surveys conducted. In many cases an establishment was a single tenant in a much larger complex, and determining the amount of landscaping attributable to a specific establishment would not be meaningful. Single tenants in larger building complexes were especially prevalent in the semiconductor manufacturing, fabricated metal product manufacturing, offices of physicians and dentists, and grocery store subsectors. Grocery stores and wholesale grocery subsectors often had no landscaping at all. In some

cases, the lot extents and/or landscapable area was not accessible without an escort. If the contact was not willing to escort the surveyor around the property in these cases due to time constraints, this portion of the survey was not completed.

B.3.2 Implementation Results

Table B-4 shows the breakdown of the 225 surveys completed in the targeted subsectors. Over the field survey implementation period, the field survey team completed an average of 12.5 surveys per week.

The positive response rate is defined as the percentage of establishments contacted by telephone that consented to the surveys. Some establishments were contacted but the schedulers were not successful in speaking with the individual authorized to agree to conduct the survey. These contacts were not included in the calculation of the positive response rate.

TABLE B-4
SUMMARY OF SURVEYS COMPLETED

Targeted Subsectors	Targeted Number of Surveys	Number of Surveys Completed	Positive Response Rate
Office Buildings	25	26	11%
Semiconductor/Electronic Component Mfg.	25	28	25%
Offices of Physicians or Dentists	23	22	29%
Fabricated Metal Product Mfg.	22	21	19%
General Medical/Surgical Hospitals	5	5	29%
Food Product Mfg.	22	22	51%
Hotels/Motels	22	22	41%
Grocery Stores	22	22	28%
Nursing Care Facilities	15	15	45%
Wholesale Grocery/Related Products Facilities	22	20	24%
Elementary/Secondary Schools	22	22	44%
TOTAL	**225**	**225**	

Note that because of the need to schedule the office building subsector through a property manager, the response rate calculation is different from the other subsectors. For office buildings the positive response rate does not reflect the number of establishments consenting divided by number of establishments contacted, but rather the number of property managers consenting divided by the number of property managers contacted. Frequently a single property management company managed multiple properties, and multiple properties were scheduled with one contact. As described previously, there was significant difficulty associated with obtaining the correct information for each targeted office building. As a result, the positive response rate in this subsector does not accurately reflect the willingness of targeted establishments to participate in the surveys.

B.3.3 Survey Reclassifications

During the field surveys, it was noted that in several cases an identified establishment in a designated subsector (by virtue of its reported NAICS code) did not represent the type of activity and water use for that subsector (i.e., the NAICS code may have been misreported). For example, a facility listed in the target database as a *physician or dentist's office* was, in reality, a facility that

manufactured semiconductor components. Therefore, after reviewing the surveys and discussing the potential options with the District, several surveys were reclassified. Table B-5 contains a listing of all reclassified surveys completed. The completed surveys are listed in their reclassified subsector in Table B-4.

TABLE B-5
SURVEY RECLASSIFICATION SCHEME

Original Survey Control Number	Revised Survey Control Number	Original Subsector Target	New Subsector Target
FM-17	SC-26/FM-17	Fabricated Metal Product Mfg.	Semiconductor and Other Electronic Component Mfg
PD-13	SC-27/PD-13	Offices of Physicians and Dentists	Semiconductor and Other Electronic Component Mfg
SC-01	OB-26/SC-01	Semiconductor and Other Electronic Component Mfg	Office Buildings
SC-04	OB-27/SC-04	Semiconductor and Other Electronic Component Mfg	Office Buildings
SC-11	OB-28/SC-11	Semiconductor and Other Electronic Component Mfg	Office Buildings
PD-05	OB-29/PD-05	Offices of Physicians and Dentists	Office Buildings
PD-07	OB-30/PD-07	Offices of Physicians and Dentists	Office Buildings
SC-12	OB-31/SC-12	Semiconductor and Other Electronic Component Mfg	Office Buildings
WG-20	OB-32/WG-20	Wholesale Grocery and Related Products	Office Buildings
WG-12	PD-24/WG-12	Wholesale Grocery and Related Products	Offices of Physicians and Dentists
WG-13	SC14/WG-13	Wholesale Grocery and Related Products	Semiconductor and Other Electronic Component Mfg
OB-19	SC-28/OB-19	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-21	SC-29/OB-21	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-22	SC-30/OB-22	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-23	PD-25/OB-23	Office Buildings	Offices of Physicians and Dentists
OB-24	SC-31/OB-24	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-25	SC-32/OB-25	Office Buildings	Semiconductor and Other Electronic Component Mfg

B.3.4 Data Analysis and Reporting

Due to the extensive nature of the data reporting for 11 subsectors and *all subsectors*, the tabulation of survey results are presented in detail in Appendix C. It should be noted that in presentations of data representing a percentage of a specific characteristic, *don't know* responses were treated as part of the denominator (i.e., they were not eliminated from the total sample size). For measurements of the

facilities with a specific type of use, *don't know responses* generally ranged from less than one percent to five percent of the responses. For ratio level data shown in Appendix C, in many cases both a mean and median variable value is reported. Mean values represent the average of all data measurements, however, it may be skewed by extremely small or large measurements of the data set. The median value represents the point in the data set that has half of the frequencies of response above it and half of the frequencies of response below it. In some cases, the median value may be more representative of the sample as a whole. Large differences between the mean and median values of a specific variable may indicate the presence of several data points in the data set that skewed the mean value.

Appendix C
Survey Data Descriptive Statistics

TABLE C-1
SURVEY RECLASSIFICATION SCHEME

Original Survey Control Number	Revised Survey Control Number	Original Subsector Target	New Subsector Target
FM-17	SC-26/FM-17	Fabricated Metal Product Mfg.	Semiconductor and Other Electronic Component Mfg
PD-13	SC-27/PD-13	Offices Of Physicians and Dentists	Semiconductor and Other Electronic Component Mfg
SC-01	OB-26/SC-01	Semiconductor and Other Electronic Component Mfg	Office Buildings
SC-04	OB-27/SC-04	Semiconductor and Other Electronic Component Mfg	Office Buildings
SC-11	OB-28/SC-11	Semiconductor and Other Electronic Component Mfg	Office Buildings
PD-05	OB-29/PD-05	Offices Of Physicians and Dentists	Office Buildings
PD-07	OB-30/PD-07	Offices Of Physicians and Dentists	Office Buildings
SC-12	OB-31/SC-12	Semiconductor and Other Electronic Component Mfg	Office Buildings
WG-20	OB-32/WG-20	Wholesale Grocery and Related Products	Office Buildings
WG-12	PD-24/WG-12	Wholesale Grocery and Related Products	Offices of Physicians and Dentists
WG-13	SC14/WG-13	Wholesale Grocery and Related Products	Semiconductor and Other Electronic Component Mfg
OB-19	SC-28/OB-19	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-21	SC-29/OB-21	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-22	SC-30/OB-22	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-23	PD-25/OB-23	Office Buildings	Offices of Physicians and Dentists
OB-24	SC-31/OB-24	Office Buildings	Semiconductor and Other Electronic Component Mfg
OB-25	SC-32/OB-25	Office Buildings	Semiconductor and Other Electronic Component Mfg

TABLE C-2
GENERAL FACILITY CHARACTERISTICS

General Site Inquiries	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS	
Number of surveys	**26**	**28**	**22**	**21**	**5**	**22**	**22**	**22**	**15**	**20**	**22**	**225**	
Age of structure (Q3) (n)	22	21	17	15	5	20	20	18	13	16	21	188	188
Mean	**1981**	**1979**	**1983**	**1980**	**1973**	**1962**	**1982**	**1968**	**1970**	**1967**	**1955**	**1973**	
Median	1980	1982	1984	1980	1970	1964	1985	1977	1964	1968	1960	1974	
Percentage of facilities with major remodeling (Q4)	31%	46%	50%	5%	40%	45%	32%	23%	33%	15%	82%	37%	
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225	225
Approx. sq. footage of buildings (Q5) (n)	23	26	19	21	4	20	8	21	11	17	7	177	177
Mean	37,538	28,612	28,195	22,280	189,501	19,918	174,125	27,507	35,233	21,535	56,338	38,903	
Median	20,000	25,500	3,500	15,000	176,106	9,000	135,000	30,000	36,000	10,700	50,884	21,896	
Average annual number of employees at site (Q6) (n)	25	28	22	21	5	22	22	22	14	20	14	215	
Mean	146	89	42	29	547	46	73	52	110	29	63	80	
Median	50	34	18	15	500	21	38	54	88	15	64	35	
Average annual number of employees at site (DUNS) (mean)	NA	27	NA	21	5	22	22	22	15	20	22	176	176
Mean	NA	190	NA	39	650	39	70	71	90	33	83	96	
Median	NA	50	NA	20	200	25	50	80	100	11	74	51	
Square feet per employee (Q5/Q6) (calculated) n	23	26	19	21	4	20	8	21	11	17	7	177	177
Mean	531	706	618	1058	292	703	1947	566	378	1111	1433	793	
Median	400	537	258	882	234	408	1729	545	250	833	1000	563	
Percentage of establishments with seasonal employment (Q6a)	0%	0%	0%	10%	0%	45%	27%	27%	0%	20%	86%	21%	
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225	224
Season with highest employment characteristic (Q6b)	NA	NA	NA	NA	NA	Summer	Summer	Summer	NA	Summer	All exc. Summer	Fall**	
Days per week in operation (Q6c) (n)	26	28	21	21	5	22	22	22	15	20	22	224	
Mean	5.2	5.3	5.5	5.2	7.0	5.8	7.0	7.0	7.0	5.5	5.0	5.8	
Median	5.0	5.0	5.5	5.0	7.0	5.8	7.0	7.0	7.0	5.0	5.0	5.0	

Note: n = sample size; **average of schools drives the ALL SUBSECTOR average to the Fall Season with highest employment.

TABLE C-3
DETAILED SITE CHARACTERISTICS

Sector/Characteristic	Data Parameter Mean	Data Parameter Median	Sample Size (n)
Office buildings			26
Number of office units in building (Q7)	11	12	18
Number of units occupied (Q8)*	30	16	19
Percentage occupied during*:			
Winter (Q8a)	86%	95%	15
Spring (Q8a)	86%	95%	15
Summer (Q8a)	86%	95%	15
Fall (Q8a)	86%	95%	15
Number of employees/office unit (Q6/Q7) (calculated)	16	10	18
Number of square feet/office unit (Q5/Q7) (calculated)	8953	4000	16
Hotels/motels			22
Percentage with banquet/conference facilities (Q9)	77%	NA	22
Square footage of banquet/conference facilities (Q9a)	13,050	13,500	8
Number of beds (Q10)	273	199	22
Average guest occupancy rate (Q11)*	167	76	21
Percentage occupied during*:			
Winter (Q11a)	51%	60%	13
Spring (Q11a)	53%	60%	13
Summer (Q11a)	60%	70%	13
Fall (Q11a)	52%	60%	13
Number of beds per 1,000 sq. feet (Q10/Q5) (calculated)	2.3	2.3	8
Number of beds per employee (Q10/Q6) (calculated)	5.6	5.2	22
Schools			22
Maximum student capacity (Q12)	651	560	21
Average student occupancy rate (Q13)*	561	433	20
Seasonal percentage of maximum student capacity*			
Winter (Q13a)	100%	100%	20
Spring (Q13a)	100%	100%	20
Summer (Q13a)	22%	3%	20
Fall (Q13a)	100%	100%	20
Number of sq. feet per student (Q5/Q13) (calculated)	223.4	133.6	7
Number of students per employee (Q13/Q6) (calculated)	7.2	6.8	20
Hospitals			5
Number of beds (Q14)	160	165	5
Number of beds/employee (Q14/Q6) (calculated)	0.43	0.42	5
Total number of private restrooms (Q14a)	62	55	4
Number of restrooms per bed (Q26ii/Q14) (calculated)	0.68	0.71	5
Total number of private restrooms per bed (Q14a/Q14)	0.51	0.57	4
Total number of common-access restrooms (Q14b)	35	8	4
Number of in-patient visits per day* (Q15)	Unknown	Unknown	0
Average overnight/residential patient occupancy rate* (Q16)	182	182	2
Seasonal percentage of full bed occupancy*	Unknown	Unknown	0
Nursing care facilities			15

TABLE C-3 (Continued)
DETAILED SITE CHARACTERISTICS

Sector/Characteristic	Data Parameter Mean	Data Parameter Median	Sample Size (n)
Number of beds (Q14)	101	99	15
Number of beds/employee (Q14/Q6) (calculated)	1.08	1.11	15
Number of restrooms per bed (Q26ii/Q14) (calculated)	0.50	0.36	15
Total number of private restrooms (Q14a)	52	50	14
Total number of private restrooms per bed (Q14a/Q14)	0.50	0.45	14
Total number of common-access restrooms (Q14b)	11	7	13
Number of in-patient visits per day* (Q15)	14	0	7
Number of in-patient visits per day/employee	0.15	0.00	7
Average overnight/residential patient occupancy rate* (Q16)	111	100	12
Seasonal percentage of full bed occupancy*			
Winter (Q16a)	97%	100%	7
Spring (Q16a)	97%	100%	7
Summer (Q16a)	97%	100%	7
Fall (Q16a)	97%	100%	7
Office of physicians/dentists			22
Average number of patient visits per day* (Q17)	54	30	21
Average number of patient visits per employee (Q17/Q6) (calculated)	2.79	2.40	21
Note:			
** Over most recent 1-year period*			

TABLE C-4
GENERAL CONSERVATION PERCEPTIONS

General Conservation Perception	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	**26**	**28**	**22**	**21**	**5**	**22**	**22**	**22**	**15**	**20**	**22**	225
Q18. On a scale from 1 to 5 (where 1 is least likely, 5 is most likely, and N/A is not applicable, how likely would your establishment be to participate in a water conservation program targeting increases in water use efficiency in (mean response shown):												
a. Plumbing fixtures for domestic uses (toilets, showers, faucets)	3.89	4.19	4.14	3.83	3.80	4.35	4.05	3.6	4.71	2.53	4.23	3.94
Sample size (n)	23	26	22	20	5	20	22	20	14	19	22	213
b. Cooling and heating units	3.50	3.37	3.62	3.06	4.00	3.74	3.95	3.35	3.27	2.61	3.95	3.48
Sample size (n)	16	27	21	16	5	19	22	20	15	18	20	199
c. Water-using product manufacturing	2.20	3.56	4.00	3.07	4.00	3.05	1.00	1.00	3.00	3.00	5.00	3.08
Sample size (n)	5	9	3	15	3	20	1	2	2	3	1	64
d. Landscaping	3.88	3.77	3.80	3.40	4.00	3.5	3.61	2.50	3.80	1.36	4.09	3.58
Sample size (n)	20	22	10	15	5	2	22	2	15	11	22	146
e. Kitchen processes and equipment	2.07	2.48	2.76	1.79	3.8	2.74	3.57	3.19	4.38	1.42	3.58	2.81
Sample size (n)	15	23	17	19	5	19	21	16	13	12	13	173
f. Laundry processes and equipment	1.20	2.63	1.50	1.60	3.80	2.75	3.32	2.50	4.29	3.00	3.8	3.03
Sample size (n)	5	8	6	5	5	4	22	4	14	1	5	79

TABLE C-4 (Continued)
GENERAL CONSERVATION PERCEPTIONS

General Conservation Perception	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Q19. On a scale from 1 to 5 (where 1 is least likely, and 5 is most likely, and N/A is not applicable), how likely would your establishment be interested in participating in (mean response shown):												
a. Full-scale facility audit prescribing operational changes in indoor water-using processes and equipment with estimated costs and benefits	2.98	3.56	3.31	3.17	2.20	3.55	4.39	3.35	4.07	2.47	4.45	3.5
Sample size (n)	23	25	18	21	5	19	22	20	15	19	22	209
b. Full-scale facility landscape audit prescribing operational changes in outdoor water-using processes and equipment with estimated costs and benefits	3.57	3.54	3.06	2.43	2.60	4.00	3.43	2.33	4.07	2.60	4.64	3.48
Sample size (n)	21	24	17	14	5	2	20	6	15	5	22	151
c. Toilet replacement rebate program that provides financial incentives to replace lower efficiency toilets	3.22	3.60	3.59	2.94	4.00	4.47	3.27	3.58	2.40	2.79	3.95	3.43
Sample size (n)	23	25	22	17	5	19	22	19	15	19	22	208
d. Program to incorporate utility-provided recycled water for indoor uses	2.26	2.68	2.13	3.00	1.60	2.52	2.27	2	3.79	1.47	1.82	2.35
Sample size (n)	23	28	20	21	5	21	22	20	14	19	22	215
e. Program to incorporate utility-provided recycled water for outdoor uses	3.33	3.42	2.82	2.79	4.00	2.00	3.24	2.5	3.93	3.00	4.14	3.36
Sample size (n)	21	24	17	14	5	2	21	6	15	5	22	152
f. Water efficient equipment and appliance rebate programs that provide financial incentives to replace lower efficiency equipment	3.17	3.08	3.26	2.22	4.67	3.26	3.73	3.67	3.27	2.35	2.83	3.14
Sample size (n)	23	25	21	18	3	19	22	18	15	17	12	193
g. Water agency sponsored workshops on water efficiency opportunities	2.35	2.27	2.86	1.98	4.00	2.57	3.68	2.00	2.80	1.60	4	2.65
Sample size (n)	23	28	22	21	5	21	22	18	15	20	22	217
h. Educational programs on water efficiency products and opportunities	2.30	2.50	2.57	1.98	3.60	2.00	3.91	2.06	2.73	1.42	4.14	2.61
Sample size (n)	23	28	21	21	5	21	22	18	15	19	22	215
i1. Community effort to institute a drought-tolerant landscape ordinance with grandfathering for existing establishments	2.41	3.09	3.25	1.97	3.60	1.00	3.05	2.43	3.60	2.44	2.17	2.73
Sample size (n)	17	23	12	17	5	2	19	14	15	16	12	152
i2. Community effort to institute a drought-tolerant landscape ordinance with no grandfathering for existing establishments	1.88	2.78	3.25	1.76	3.00	1.00	2.42	2.07	3.07	1.88	1.92	2.34
Sample size (n)	17	23	12	17	5	2	19	14	15	16	12	115
j1. Voluntary program which promotes the converstion of existing landscaping to drought-tolerant landscaping supported by grants for all establishments	3.29	3.92	3.17	2.71	2.60	1.00	3.27	2.57	3.36	2.53	3.95	3.24
Sample size (n)	17	24	12	17	5	2	22	14	14	15	22	164
j2. Voluntary program which promotes the conversion of existing landscaping to drought-tolerant landscaping supported by loans for all establishments	1.53	2.83	2.42	2.12	2.20	1.00	2.45	1.93	2.64	1.93	3.09	2.36
Sample size (n)	17	24	12	17	5	2	22	14	14	15	22	164
j3. Voluntary program which promotes the conversion of existing landscaping to drought-tolerant landscaping with no financial support for establishments	1.41	1.96	1.58	1.71	2.00	1.00	1.73	1.5	2.07	1.13	2.86	1.82
Sample size (n)	17	24	12	17	5	2	22	14	14	15	22	164

TABLE C-4 (Continued)
GENERAL CONSERVATION PERCEPTIONS

General Conservation Perception	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Q20. On a scale from 1 to 5 (where 1 is least important and 5 is most important), how would you rate the following as incentives to conserve water:												
a. Save money	4.57	4.46	4.55	4.31	4.80	4.48	4.55	4.8	4.47	4.60	4.95	4.58
Sample size (n)	23	28	22	21	5	21	22	20	15	20	22	219
b. Protect environment	4.30	4.57	4.77	4.68	4.40	4.52	4.2	4.65	4.47	4.45	4.86	4.55
Sample size (n)	23	28	22	21	5	21	22	20	15	20	22	219
c. Prevent future water shortages	4.30	4.89	4.86	4.64	4.60	4.81	4.55	4.65	4.73	4.65	4.77	4.69
Sample size (n)	23	28	22	21	5	21	22	20	15	20	22	219
d. Other	1.00	5.00	1.00	1.00	0.00	0.00	1.00	1.30	4.50	1.40	5	1.34
Sample size (n)	19	3	22	21	0	0	22	20	2	20	3	132
Q21. On a scale from 1 to 5 (where 1 is least important and 5 is most important), to what extent has the following media contributed to your awareness of new water conservation opportunities?												
a. Newspaper stories or advertisements	2.74	2.82	2.55	2.05	2.20	2.10	2.27	2.8	2.87	2.15	3.36	2.56
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
b. Radio advertisements or programs	2.37	2.64	2.32	2.05	2.20	1.76	1.82	2.4	3.33	1.90	1.27	2.16
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	2.15
c. Television advertisements or programs	2.29	3.36	3.27	2.48	3.20	3.52	3.23	2.85	3.53	2.25	1.59	2.85
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
d. Internet-based research	1.58	1.57	2.00	2.00	2.80	2.10	1.45	1.45	2.20	1.40	2.59	1.85
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
e. Word-of-mouth via other water professionals	2.79	3.11	2.55	2.26	3.80	1.43	4.23	2.25	3.40	2.90	3.55	2.87
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
f. Direct business solicitation by private firms (e.g., landscape architects)	2.05	1.75	1.73	1.62	1.80	1.24	2.36	1.15	2.40	1.50	2.36	1.8
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
g. Professional periodicals	2.05	1.88	2.55	1.38	2.40	1.33	2.05	1.25	2.07	1.60	2.23	1.85
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
h. Professional conferences	1.63	1.39	1.95	1.60	2.40	1.05	2.14	1.1	1.67	1.45	1.73	1.59
Sample size (n)	19	28	22	21	5	21	22	20	15	20	22	215
i. Information and/or consultation provided by the SCVWD	2.68	2.75	3.00	2.79	1.80	2.86	2.41	2.4	2.73	3.10	3.09	2.76
Sample size (n)	19	28	21	21	5	21	22	20	15	20	22	214

TABLE C-5
WATER SOURCE INQUIRIES

General Response	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	**26**	**28**	**22**	**21**	**5**	**22**	**22**	**22**	**15**	**20**	**22**	**225**
Q22a. Are you aware that in parts of Santa Clara County, recycled water from the water service provider is made available to establishments through separate service lines?												
Percentage of Yes responses	58%	61%	32%	19%	60%	41%	68%	23%	67%	70%	82%	52%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
Q23. What sources of water does this facility use? (percentage of Yes responses)												
a. Utility-provided potable water	92%	100%	100%	100%	100%	95%	100%	91%	100%	100%	100%	98%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
b. Utility-provided recycled water	15%	18%	0%	0%	0%	0%	27%	0%	0%	0%	5%	7%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
c. On-site recycled water	0%	4%	0%	19%	0%	0%	0%	0%	0%	10%	0%	3%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
d. Private well for potable uses	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
e. Private well for landscape or other uses	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
f. Private surface water source (ponds)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
g. Other	4%	4%	0%	10%	0%	0%	0%	0%	33%	0%	5%	4%
Sample size (n)	26	28	22	21	5	22	22	22	15	20	22	225
Q23d. (If YES to any recycled water) What is your primary reason for using this recycled water? (percentage of Yes responses)												
d1. Save money	0%	33%	0%	50%	0%	0%	33%	0%	0%	100%	100%	39%
Sample size (n)	4	6	0	4	0	0	6	0	0	2	1	23
d2. Protect environment	0%	33%	0%	25%	0%	0%	50%	0%	0%	0%	0%	26%
Sample size (n)	4	6	0	4	0	0	6	0	0	2	1	23
d3. Prevent future shortages	75%	17%	0%	75%	0%	0%	17%	0%	0%	0%	0%	35%
Sample size (n)	4	6	0	4	0	0	6	0	0	2	1	23
d4. Other	25%	17%	0%	0%	0%	0%	0%	0%	0%	0%	0%	9%
Sample size (n)	4	6	0	4	0	0	6	0	0	2	1	23

TABLE C-5 (Continued)
WATER SOURCE INQUIRIES

General Response	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Q23e. (If no to utility provided recycled water) What is the primary reason for its nonuse? (percentage of Yes responses)												
e1. No service connections to this facility	63%	59%	48%	38%	40%	33%	44%	30%	57%	45%	81%	50%
Sample size (n)	19	22	21	21	5	21	16	20	14	20	21	200
e2. Rates are too high	0%	14%	0%	5%	0%	10%	13%	10%	0%	10%	0%	6%
Sample size (n)	18	22	21	21	5	21	16	20	14	20	21	199
e3. Water quality is too poor	0%	14%	38%	33%	20%	52%	19%	25%	14%	45%	5%	25%
Sample size (n)	18	22	21	21	5	21	16	20	14	20	21	199
e4. Requires costly equipment changes	28%	5%	5%	5%	0%	5%	50%	10%	7%	20%	5%	11%
Sample size (n)	18	22	21	21	5	21	16	20	14	20	21	199
e5. Other	28%	23%	10%	29%	40%	14%	6%	10%	21%	15%	29%	19%
Sample size (n)	18	22	21	21	5	21	16	20	14	20	21	199
Q24. If you know your facility does not currently have access to service connections for utility-provided recycled water, would you use this type of water if it were made available to you?												
Percentage of Yes responses	62%	68%	68%	75%	60%	41%	38%	23%	93%	25%	84%	57%
Sample size (n)	21	22	22	20	5	22	16	22	15	20	19	204
Q25. If you facility does have access to utility-provided recycled water but chooses not to use it, and there were a severe drought or water shortage in Santa Clara County, would you be more likely to use it?												
Percentage of Yes responses	40%	100%	100%	0%	33%	0%	56%	0%	100%	0%	91%	61%
Sample size (n)	5	1	1	0	3	0	9	1	2	0	11	33

TABLE C-6
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Office buildings				Semiconductor/electronic component				Office of physician or dentist			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**26**				**28**				**22**
Q26. Domestic/sanitary use (drinking fountains, restrooms, etc)	100%				100%				100%			
Q26a. For Employee use	100%				100%				100%			
Q26b. For customer/student/patient/public use	96%				68%				95%			
Q26c. Restrooms	100%	6.85	4.50	26	100%	4.11	4.00	28	100%	5.05	3.00	21
Q26d. Toilets	100%	14.79	10.00	24	100%	8.96	7.00	28	100%	6.00	3.00	21
Q26e. Urinals	96%	4.50	2.00	24	93%	3.04	2.00	26	32%	3.14	2.00	7
Q26e.1. Waterless urinals	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q26f. Showers	38%	1.44	1.00	9	39%	2.36	2.00	11	9%	1.50	1.50	2
Q26g. Restroom faucets	100%	14.00	8.00	24	100%	8.04	4.00	28	100%	6.86	3.00	21
Q26h. Drinking fountains	73%	4.22	3.00	18	57%	1.94	1.00	16	32%	2.17	1.50	6
Q27. Facility cooling and heating	96%				86%				45%			
Q27a. Cooling Towers	31%	1.75	1.00	8	36%	1.67	1.00	9	18%	1.33	1.00	3
Q27a.1. Evaporative cooling tower with blowdown	8%	1.00	1.00	2	4%	1.00	1.00	1	0%	0.00	0.00	0
Q27a.2. Evaporative cooling tower with conventional chemical trea	19%	1.00	1.00	5	14%	2.25	2.50	4	9%	1.50	1.50	2
Q27a.1. Evaporative cooling tower with air heat exchange	8%	1.00	1.00	2	14%	1.25	1.00	4	5%	1.00	1.00	1
Q27b. Evaporative coolers	4%	3.00	3.00	1	11%	2.67	2.00	3	5%	6.00	6.00	1
Q27c. Air washers	0%	0.00	0.00	0	4%	3.00	3.00	1	0%	0.00	0.00	0
Q27d. Humidifiers	8%	1.00	1.00	2	25%	2.86	1.00	7	5%	9.00	9.00	1
Q27e. Boilers	31%	1.43	1.00	7	32%	1.67	2.00	9	14%	2.00	2.00	3
Q27f. Hydronic hot water heating	19%	1.20	1.00	5	11%	2.33	2.00	3	9%	1.50	1.50	2
Q27g. Circulating hot water heating	42%	1.60	2.00	10	57%	2.06	1.50	16	36%	1.75	1.00	8
Q27h. Steam heating	4%	0.00	0.00	0	4%	4.00	4.00	1	0%	0.00	0.00	0
Q28. Once-through cooling	81%				46%				27%			
Q28a. Air conditioners	81%	6.24	3.00	17	43%	8.50	3.00	12	27%	1.67	2.00	6
Q28b. Air compressors	42%	4.88	6.00	8	39%	2.40	2.00	10	18%	4.33	4.00	3
Q29. Laundry	0%				0%				18%			
Q29a. Commercial washing machines	0%	0.00	0.00	0	0%	0.00	0.00	0	14%	1.00	1.00	3
Q29b. Self-service washing machines	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q30. Kitchen facilities	88%	2.95	1.50	22	79%	1.32	1.00	22	82%	1.06	1.00	18
Q30a. Dishwashing machines	42%	2.55	1.00	11	21%	1.83	1.50	6	18%	1.00	1.00	4
Q30b. Kitchen faucets	85%	3.36	3.50	22	71%	1.90	1.00	20	73%	1.44	1.00	16
Q30c. Pre-rinse sprayers	4%				7%				5%			
Q30.c.1. High-flow pre-rinse sprayers	4%	1.00	1.00	1	0%	0.00	0.00	0	5%	1.00	1.00	1
Q30c.2. Low-flow pre-rinse sprayers	0%	0.00	0.00	0	7%	1.00	1.00	2	0%	0.00	0.00	0
Q30d. Food steamers	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q30e. Garbage disposers	58%	4.07	4.00	14	36%	1.80	1.00	10	18%	2.25	1.00	4
Q30f. Water-cooled refrigeration	0%	0.00	0.00	0	4%	1.00	1.00	1	0%	0.00	0.00	0
Q31. Ice-making machines	8%				18%				9%			
Q31a. Water-cooled icemaking machines	0%	0.00	0.00	0	0%	0.00	0.00	0	5%	1.00	1.00	1
Q31b. Air-cooled icemaking machines	4%	2.00	2.00	1	14%	1.00	1.00	4	9%	1.50	1.50	2
Q32. Washing and sanitation	35%				50%				68%			
Q32a. General facility washdown and clean-up	15%				11%				27%			
Q32b. Sterilization equipment/autoclaves	4%	3.00	3.00	1	0%	0.00	0.00	0	64%	1.77	1.00	13
Q32c. Vehicle washes	4%	1.00	1.00	1	0%	0.00	0.00	0	0%	0.00	0.00	0
Q32d. Utility (general cleaning faucets)	23%	2.50	1.50	6	43%	1.92	2.00	12	45%	5.22	2.00	9
Q32e. Water-based sweeping equipment	8%	1.00	1.00	2	4%	6.00	6.00	1	0%	0.00	0.00	0

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Office buildings				Semiconductor/electronic component				Office of physician or dentist			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**26**				**28**				**22**
Q33. Maintenance shops	15%	1.25	1.00	4	32%	1.00	1.00	7	9%	1.00	1.00	2
Q33a. Mainenance area faucets	8%	1.50	1.50	2	11%	1.33	1.00	3	9%	1.00	1.00	2
Q34. Laboratories	8%	1.00	1.00	2	46%	1.31	1.00	13	59%	2.50	1.00	12
Q34a. Laboratory faucets	4%	6.00	6.00	1	29%	5.25	2.50	8	55%	7.00	3.50	12
Q35. Process water for product manufacturing	4%				71%				0%			
Q35a. Process water as part of the product	0%				4%				0%			
Q35b. Water to convey product	0%				0%				0%			
Q35c. Product rinsing units	4%	1.00	1.00	1	54%	13.07	2.50	14	0%	0.00	0.00	0
Q35d. Milling, drillng, or cutting fluids	0%	0.00	0.00	0	7%	6.50	6.50	2	0%	0.00	0.00	0
Q35e. Chemical mixing	0%	0.00	0.00	0	25%	3.75	1.50	6	0%	0.00	0.00	0
Q35f. Manufacturing equipment cooling	0%	0.00	0.00	0	43%	15.58	3.00	12	0%	0.00	0.00	0
Q36. Process water purification equipment	15%	4.33	2.00	3	71%	6.26	3.00	19	32%	7.33	1.50	6
Q36a. Water softeners	12%	4.00	1.00	3	18%	2.80	1.00	5	23%	1.60	1.00	5
Q36b. Water filters	15%	3.50	1.50	4	14%	1.75	1.50	4	23%	3.20	2.00	5
Q36c. Reverse osmosis units	4%	10.00	10.00	1	21%	1.20	1.00	5	9%	2.50	2.50	2
Q36d. Deionization/ion exchange units	4%	8.00	8.00	1	57%	3.00	2.00	16	5%	1.00	1.00	1
Q36e. Sediment filtration	0%	0.00	0.00	0	7%	2.00	2.00	2	5%	2.00	2.00	1
Q36f. Activated carbon filtration	4%	10.00	10.00	1	4%	40.00	40.00	1	5%	16.00	16.00	1
Q36g. Ultra pure water used	0%				7%				5%			
Q37. Wastewater pretreatment equipment	4%	2.00	2.00	1	32%	1.22	1.00	9	5%	1.00	1.00	1
Q38. Miscellaneous water use	8%				21%				50%			
Q38a. Photographic/X-ray processing	4%	1.00	1.00	1	0%	0.00	0.00	0	41%	1.56	1.00	9
Q38b. Dialysis units	0%	0.00	0.00	0	0%	0.00	0.00	0	9%	29.00	29.00	2
Q38c. Liquid gas vaporizers	0%	0.00	0.00	0	4%	2.00	2.00	1	5%	4.00	4.00	1
Q38d. Fume/gas scrubbers	0%	0.00	0.00	0	21%	3.83	2.00	6	0%	0.00	0.00	0
Q38e. Liquid ring vacuum pumps	4%	3.00	3.00	1	0%	0.00	0.00	0	23%	3.40	2.00	5
Q39. Landscape uses	81%				68%				50%			
Q40. Water features	8%				0%				0%			
Q40a. Swimming pools	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q40b. Jacuzzis/spas	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q40c. Fountains	8%	2.00	2.00	2	0%	0.00	0.00	0	0%	0.00	0.00	0
Q41. Pressure regulators off the incoming line for indoor uses	8%	2.00	2.00	2	18%	1.67	2.00	3	0%	0.00	0.00	0
Q56. Water pressure at the highest available indoor fixture		69.43	68.00	14		63.75	61.00	10		63.11	60.00	9
Q42. Pressure regulators off the incoming line for outdoor uses	4%	1.00	1.00	1	7%	0.00	0.00	0	0%	0.00	0.00	0
Q43. Separate water meters for specific puposes of water use	42%				32%				9%			
Q44. Other indoor water-using equipment	19%				7%				18%			
	fire sprinklers hot water heater fish tank				ultrasonic cleaners cooled water							

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Fabricated metal product manufacturer				Hospital				Food product manufacturer			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**21**				**5**				**22**
Q26. Domestic/sanitary use (drinking fountains, restrooms, etc)	100%				100%				100%			
Q26a. For Employee use	100%				100%				100%			
Q26b. For customer/student/patient/public use	86%				100%				45%			
Q26c. Restrooms	100%	3.57	3.00	21	100%	118.00	70.00	5	100%	3.18	3.00	22
Q26d. Toilets	100%	5.14	4.00	21	100%	125.00	70.00	5	100%	4.50	3.00	22
Q26e. Urinals	71%	2.20	2.00	15	60%	9.67	10.00	3	54%	2.17	1.00	12
Q26e.1. Waterless urinals	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q26f. Showers	33%	1.00	1.00	7	100%	55.80	60.00	5	9%	1.50	1.50	2
Q26g. Restroom faucets	100%	4.71	4.00	21	100%	125.20	70.00	5	100%	3.77	3.00	22
Q26h. Drinking fountains	48%	1.22	1.00	9	100%	9.00	10.00	5	27%	2.17	2.00	6
Q27. Facility cooling and heating	71%				80%				100%			
Q27a. Cooling Towers	10%	1.00	1.00	2	60%	2.00	2.00	3	27%	3.50	3.00	6
Q27a.1. Evaporative cooling tower with blowdown	0%	0.00	0.00	0	40%	2.00	2.00	1	9%	3.50	3.50	2
Q27a.2. Evaporative cooling tower with conventional chemical treat	5%	1.00	1.00	1	20%	2.00	2.00	1	18%	2.25	2.50	4
Q27a.1. Evaporative cooling tower with air heat exchange	5%	1.00	1.00	1	0%	0.00	0.00	0	5%	1.00	1.00	1
Q27b. Evaporative coolers	5%	2.00	2.00	1	0%	0.00	0.00	0	14%	2.00	1.00	3
Q27c. Air washers	0%	0.00	0.00	0	0%	0.00	0.00	0	9%	1.50	1.50	2
Q27d. Humidifiers	0%	0.00	0.00	0	40%	15.00	15.00	2	0%	0.00	0.00	0
Q27e. Boilers	10%	1.50	1.50	2	80%	4.50	4.50	4	64%	1.29	1.00	14
Q27f. Hydronic hot water heating	5%	1.00	1.00	1	0%	0.00	0.00	0	5%	1.00	1.00	1
Q27g. Circulating hot water heating	57%	1.50	1.00	12	20%	0.00	0.00	0	77%	1.41	1.00	17
Q27h. Steam heating	0%	0.00	0.00	0	20%	0.00	0.00	0	0%	0.00	0.00	0
Q28. Once-through cooling	52%				40%				36%			
Q28a. Air conditioners	52%	2.70	2.50	10	20%	13.00	13.00	1	14%	4.33	2.00	3
Q28b. Air compressors	52%	1.73	2.00	11	40%	9.50	9.50	2	32%	2.29	2.00	7
Q29. Laundry	5%				80%				27%			
Q29a. Commercial washing machines	0%	0.00	0.00	0	40%	2.50	2.50	2	14%	1.33	1.00	3
Q29b. Self-service washing machines	0%	0.00	0.00	0	40%	1.00	1.00	2	14%	1.00	1.00	3
Q30. Kitchen facilities	62%	1.15	1.00	13	100%	2.00	1.00	5	77%	1.24	1.00	17
Q30a. Dishwashing machines	10%	1.50	1.50	2	100%	1.00	1.00	5	27%	1.00	1.00	6
Q30b. Kitchen faucets	52%	1.27	1.00	11	100%	5.40	5.00	5	68%	3.40	2.00	15
Q30c. Pre-rinse sprayers	5%				60%				23%			
Q30.c.1. High-flow pre-rinse sprayers	0%	0.00	0.00	0	60%	1.67	2.00	3	18%	1.25	1.00	4
Q30c.2. Low-flow pre-rinse sprayers	5%	1.00	1.00	1	0%	0.00	0.00	0	9%	1.50	1.50	2
Q30d. Food steamers	0%	0.00	0.00	0	40%	1.00	1.00	2	9%	1.00	1.00	2
Q30e. Garbage disposers	10%	1.00	1.00	2	80%	1.50	1.50	4	14%	1.67	2.00	3
Q30f. Water-cooled refrigeration	5%	1.00	1.00	1	0%	0.00	0.00	0	9%	1.00	1.00	2
Q31. Ice-making machines	0%				100%				32%			
Q31a. Water-cooled icemaking machines	0%	0.00	0.00	0	0%	0.00	0.00	0	5%	1.00	1.00	1
Q31b. Air-cooled icemaking machines	0%	0.00	0.00	0	100%	8.40	6.00	5	27%	1.00	1.00	6
Q32. Washing and sanitation	67%				60%				68%			
Q32a. General facility washdown and clean-up	5%				0%				45%			
Q32b. Sterilization equipment/autoclaves	0%	0.00	0.00	0	60%	6.00	6.00	3	0%	0.00	0.00	0
Q32c. Vehicle washes	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q32d. Utility (general cleaning faucets)	62%	2.38	1.00	13	60%	13.33	10.00	3	41%	6.22	4.00	9
Q32e. Water-based sweeping equipment	10%	1.00	1.00	2	0%	0.00	0.00	0	18%	1.25	1.00	4

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Fabricated metal product manufacturer				Hospital				Food product manufacturer			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**21**				**5**				**22**
Q33. Maintenance shops	19%	1.00	1.00	4	20%	1.00	1.00	1	23%	1.00	1.00	3
Q33a. Mainenance area faucets	0%	0.00	0.00	0	20%	2.00	2.00	1	14%	1.00	1.00	3
Q34. Laboratories	19%	1.00	1.00	4	60%	1.00	1.00	3	18%	1.00	1.00	2
Q34a. Laboratory faucets	10%	2.00	2.00	2	60%	8.00	10.00	3	18%	1.75	1.50	4
Q35. Process water for product manufacturing	81%				0%				77%			
Q35a. Process water as part of the product	5%				0%				64%			
Q35b. Water to convey product	0%				0%				9%			
Q35c. Product rinsing units	33%	3.57	3.00	7	0%	0.00	0.00	0	9%	2.00	2.00	1
Q35d. Milling, drillng, or cutting fluids	33%	3.71	2.00	7	0%	0.00	0.00	0	0%	0.00	0.00	0
Q35e. Chemical mixing	19%	12.00	5.00	3	0%	0.00	0.00	0	5%	1.00	1.00	1
Q35f. Manufacturing equipment cooling	38%	2.88	2.00	8	0%	0.00	0.00	0	18%	2.50	1.50	4
Q36. Process water purification equipment	38%	3.50	4.00	6	100%	5.60	2.00	5	55%	2.11	2.00	9
Q36a. Water softeners	10%	1.00	1.00	2	100%	4.00	2.00	5	41%	1.33	1.00	9
Q36b. Water filters	19%	2.00	1.50	4	20%	2.00	2.00	1	27%	2.50	1.50	6
Q36c. Reverse osmosis units	10%	1.00	1.00	1	0%	0.00	0.00	0	5%	1.00	1.00	1
Q36d. Deionization/ion exchange units	29%	2.83	3.00	6	0%	0.00	0.00	0	0%	0.00	0.00	0
Q36e. Sediment filtration	10%	1.00	1.00	2	20%	6.00	6.00	1	5%	1.00	1.00	1
Q36f. Activated carbon filtration	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q36g. Ultra pure water used	5%				0%				0%			
Q37. Wastewater pretreatment equipment	14%	1.67	1.00	3	0%	0.00	0.00	0	23%	2.67	1.00	3
Q38. Miscellaneous water use	0%				60%				9%			
Q38a. Photographic/X-ray processing	0%	0.00	0.00	0	60%	5.00	2.00	3	0%	0.00	0.00	0
Q38b. Dialysis units	0%	0.00	0.00	0	40%	2.00	2.00	2	0%	0.00	0.00	0
Q38c. Liquid gas vaporizers	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q38d. Fume/gas scrubbers	0%	0.00	0.00	0	0%	0.00	0.00	0	5%	1.00	1.00	1
Q38e. Liquid ring vacuum pumps	0%	0.00	0.00	0	0%	0.00	0.00	0	5%	4.00	4.00	1
Q39. Landscape uses	24%				100%				36%			
Q40. Water features	0%				40%				0%			
Q40a. Swimming pools	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q40b. Jacuzzis/spas	0%	0.00	0.00	0	20%	1.00	1.00	1	0%	0.00	0.00	0
Q40c. Fountains	0%	0.00	0.00	0	20%	1.00	1.00	1	0%	0.00	0.00	0
Q41. Pressure regulators off the incoming line for indoor uses	10%	1.00	1.00	1	20%	2.00	2.00	1	14%	1.00	1.00	1
Q56. Water pressure at the highest available indoor fixture		65.50	66.50	10		66.25	73.00	4		67.00	67.00	11
Q42. Pressure regulators off the incoming line for outdoor uses	5%	1.00	1.00	1	20%	4.00	4.00	1	5%	0.00	0.00	0
Q43. Separate water meters for specific puposes of water use	14%				40%				27%			
Q44. Other indoor water-using equipment	29%				20%				9%			
	Rinse tanks tumbler for metal products Wire EDM Rinsing faucets for cold-plating Emergency eyewash								coffee makers			

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Hotel/motel				Grocery store				Nursing care facilities			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**22**				**22**				**15**
Q26. Domestic/sanitary use (drinking fountains, restrooms, etc)	100%				100%				100%			
Q26a. For Employee use	95%				100%				100%			
Q26b. For customer/student/patient/public use	100%				100%				100%			
Q26c. Restrooms	100%	181.36	154.00	22	100%	2.67	2.00	21	100%	50.13	35.00	15
Q26d. Toilets	100%	197.14	157.00	22	100%	3.59	3.50	22	100%	50.93	35.00	15
Q26e. Urinals	73%	4.44	4.00	16	73%	1.94	1.00	16	7%	1.00	1.00	1
Q26e.1. Waterless urinals	0%	0.00	0.00	0	5%	2.00	2.00	1	0%	0.00	0.00	0
Q26f. Showers	100%	193.24	151.00	21	5%	2.00	2.00	1	100%	22.53	9.00	15
Q26g. Restroom faucets	100%	200.33	155.00	21	100%	3.05	2.50	22	100%	49.80	35.00	15
Q26h. Drinking fountains	64%	2.14	2.00	14	41%	1.33	1.00	9	80%	2.00	2.00	12
Q27. Facility cooling and heating	95%				82%				*100%*			
Q27a. Cooling Towers	36%	1.25	1.00	8	41%	1.00	1.00	9	0%	0.00	0.00	0
Q27a.1. Evaporative cooling tower with blowdown	18%	1.25	1.00	4	0%	0.00	0.00	0	0%	0.00	0.00	0
Q27a.2. Evaporative cooling tower with conventional chemical trea	14%	1.33	1.00	3	14%	1.00	1.00	3	0%	0.00	0.00	0
Q27a.1. Evaporative cooling tower with air heat exchange	14%	1.00	1.00	3	9%	1.00	1.00	2	0%	0.00	0.00	0
Q27b. Evaporative coolers	9%	2.50	2.50	2	0%	0.00	0.00	0	20%	5.67	1.00	3
Q27c. Air washers	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q27d. Humidifiers	0%	0.00	0.00	0	0%	0.00	0.00	0	27%	1.75	1.50	4
Q27e. Boilers	73%	3.13	2.00	16	18%	1.50	1.50	4	53%	3.38	4.00	8
Q27f. Hydronic hot water heating	27%	7.00	4.50	6	23%	1.80	2.00	5	33%	4.40	4.00	5
Q27g. Circulating hot water heating	59%	3.15	3.00	13	32%	1.14	1.00	7	47%	2.29	2.00	7
Q27h. Steam heating	0%	0.00	0.00	0	0%	0.00	0.00	0	7%	3.00	3.00	1
Q28. Once-through cooling	55%				55%				47%			
Q28a. Air conditioners	41%	2.89	2.00	9	45%	1.40	1.00	10	53%	27.75	14.00	8
Q28b. Air compressors	27%	3.83	1.50	6	32%	5.00	3.00	7	7%	1.00	1.00	1
Q29. Laundry	86%				5%				100%			
Q29a. Commercial washing machines	82%	2.33	2.00	18	0%	0.00	0.00	0	100%	2.67	2.00	15
Q29b. Self-service washing machines	59%	1.85	2.00	13	5%	1.00	1.00	1	27%	2.50	1.00	4
Q30. Kitchen facilities	91%	1.30	1.00	20	77%	1.24	1.00	17	93%	5.43	1.00	14
Q30a. Dishwashing machines	86%	1.68	1.00	19	0%	0.00	0.00	0	87%	2.92	1.00	13
Q30b. Kitchen faucets	91%	9.05	5.00	19	77%	4.00	4.00	17	100%	7.33	3.00	15
Q30c. Pre-rinse sprayers	64%				55%				60%			
Q30.c.1. High-flow pre-rinse sprayers	41%	2.29	2.00	7	23%	1.40	1.00	5	27%	7.75	1.00	4
Q30c.2. Low-flow pre-rinse sprayers	32%	1.50	1.00	6	36%	2.75	3.00	8	40%	1.00	1.00	6
Q30d. Food steamers	18%	1.25	1.00	4	27%	1.00	1.00	6	40%	1.33	1.00	6
Q30e. Garbage disposers	45%	2.10	1.50	10	5%	1.00	1.00	1	87%	6.08	1.00	13
Q30f. Water-cooled refrigeration	14%	4.33	3.00	3	0%	0.00	0.00	0	20%	4.50	5.00	4
Q31. Ice-making machines	95%				77%				100%			
Q31a. Water-cooled icemaking machines	5%	3.00	3.00	1	5%	1.00	1.00	1	20%	1.00	1.00	3
Q31b. Air-cooled icemaking machines	91%	4.55	4.00	20	68%	1.47	1.00	15	80%	1.45	1.00	11
Q32. Washing and sanitation	32%				64%				100%			
Q32a. General facility washdown and clean-up	27%				41%				93%			
Q32b. Sterilization equipment/autoclaves	0%	0.00	0.00	0	0%	0.00	0.00	0	27%	2.25	1.00	4
Q32c. Vehicle washes	0%	0.00	0.00	0	0%	0.00	0.00	0	13%	1.00	1.00	1
Q32d. Utility (general cleaning faucets)	23%	5.20	4.00	5	27%	2.67	1.00	6	73%	5.89	3.00	9
Q32e. Water-based sweeping equipment	9%	1.50	1.50	2	18%	1.00	1.00	4	20%	1.33	1.00	3

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Hotel/motel				Grocery store				Nursing care facilities			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**22**				**22**				**15**
Q33. Maintenance shops	27%	1.00	1.00	6	0%	0.00	0.00	0	40%	1.00	1.00	6
Q33a. Mainenance area faucets	9%	1.00	1.00	2	5%	1.00	1.00	1	13%	1.00	1.00	2
Q34. Laboratories	0%	0.00	0.00	0	0%	0.00	0.00	0	7%	1.00	1.00	1
Q34a. Laboratory faucets	0%	0.00	0.00	0	0%	0.00	0.00	0	7%	2.00	2.00	1
Q35. Process water for product manufacturing	0%				0%				0%			
Q35a. Process water as part of the product	0%				0%				0%			
Q35b. Water to convey product	0%				0%				0%			
Q35c. Product rinsing units	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q35d. Milling, drillng, or cutting fluids	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q35e. Chemical mixing	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q35f. Manufacturing equipment cooling	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q36. Process water purification equipment	64%	3.30	2.00	10	41%	1.22	1.00	9	80%	3.75	3.00	12
Q36a. Water softeners	55%	2.08	2.00	12	9%	1.00	1.00	2	60%	1.67	2.00	9
Q36b. Water filters	23%	3.40	3.00	5	27%	1.17	1.00	6	47%	3.00	2.00	7
Q36c. Reverse osmosis units	5%	2.00	2.00	1	9%	1.00	1.00	2	20%	1.67	1.00	3
Q36d. Deionization/ion exchange units	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q36e. Sediment filtration	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q36f. Activated carbon filtration	0%	0.00	0.00	0	0%	0.00	0.00	0	13%	2.00	2.00	2
Q36g. Ultra pure water used	0%				0%				0%			
Q37. Wastewater pretreatment equipment	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q38. Miscellaneous water use	5%				14%				47%			
Q38a. Photographic/X-ray processing	0%	0.00	0.00	0	14%	1.00	1.00	3	13%	1.00	1.00	2
Q38b. Dialysis units	0%	0.00	0.00	0	0%	0.00	0.00	0	13%	1.00	1.00	2
Q38c. Liquid gas vaporizers	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q38d. Fume/gas scrubbers	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q38e. Liquid ring vacuum pumps	0%	0.00	0.00	0	0%	0.00	0.00	0	0%	0.00	0.00	0
Q39. Landscape uses	100%				32%				100%			
Q40. Water features	82%				0%				20%			
Q40a. Swimming pools	77%	1.06	1.00	17	0%	0.00	0.00	0	0%	0.00	0.00	0
Q40b. Jacuzzis/spas	73%	2.81	1.00	16	0%	0.00	0.00	0	7%	1.00	1.00	1
Q40c. Fountains	18%	2.50	1.50	4	0%	0.00	0.00	0	13%	1.00	1.00	2
Q41. Pressure regulators off the incoming line for indoor uses	23%	1.25	1.00	4	14%	1.00	1.00	2	40%	3.25	1.00	4
Q56. Water pressure at the highest available indoor fixture		61.94	63.00	18		72.60	75.00	5		68.18	66.50	14
Q42. Pressure regulators off the incoming line for outdoor uses	14%	1.50	1.50	2	0%	0.00	0.00	0	13%	1.00	1.00	1
Q43. Separate water meters for specific puposes of water use	14%				0%				7%			
Q44. Other indoor water-using equipment	18%				55%				27%			
	fish tank eye wash mini bars faucets				misters for produce				fish tank hair salon			

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

Specified Water Uses/Appliances	Wholesale grocery/related products facility				Elementary/secondary school				ALL SUBSECTORS			
	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**20**				**22**				**225**
Q26. Domestic/sanitary use (drinking fountains, restrooms, etc)	100%				100%				100%			
Q26a. For Employee use	100%				100%				100%			
Q26b. For customer/student/patient/public use	75%				100%				86%			
Q26c. Restrooms	100%	2.95	3.00	20	100%	12.23	10.00	22	100%	28.07	4.00	223
Q26d. Toilets	100%	3.90	3.00	20	100%	26.45	23.50	20	100%	33.41	8.00	220
Q26e. Urinals	65%	1.77	2.00	13	95%	14.00	11.00	19	69%	4.53	2.00	152
Q26e.1. Waterless urinals	0%	0.00	0.00	0	5%	3.00	3.00	1	1%	2.50	2.50	2
Q26f. Showers	10%	1.00	1.00	2	27%	40.83	40.00	6	37%	61.43	7.00	81
Q26g. Restroom faucets	100%	3.35	3.00	20	100%	24.78	27.50	18	100%	32.47	6.00	217
Q26h. Drinking fountains	25%	1.00	1.00	5	100%	13.75	5.00	20	56%	4.46	2.00	120
Q27. Facility cooling and heating	70%				95%				84%			
Q27a. Cooling Towers	10%	1.50	1.50	2	0%	0.00	0.00	0	23%	1.68	1.00	50
Q27a.1. Evaporative cooling tower with blowdown	5%	2.00	2.00	1	0%	0.00	0.00	0	5%	1.72	1.00	11
Q27a.2. Evaporative cooling tower with conventional chemical treat	0%	0.00	0.00	0	0%	0.00	0.00	0	10%	1.57	1.00	23
Q27a.1. Evaporative cooling tower with air heat exchange	0%	0.00	0.00	0	0%	0.00	0.00	0	6%	1.07	1.00	14
Q27b. Evaporative coolers	10%	1.00	1.00	2	9%	5.00	5.00	2	8%	3.28	2.00	18
Q27c. Air washers	0%	0.00	0.00	0	0%	0.00	0.00	0	1%	2.00	2.00	3
Q27d. Humidifiers	0%	2.00	2.00	1	0%	0.00	0.00	0	8%	4.12	2.00	17
Q27e. Boilers	15%	1.67	1.00	3	55%	1.92	2.00	12	37%	2.21	2.00	82
Q27f. Hydronic hot water heating	5%	2.00	2.00	1	9%	2.50	2.50	2	14%	3.16	2.00	31
Q27g. Circulating hot water heating	55%	1.09	1.00	11	36%	1.50	1.00	8	49%	1.78	1.00	109
Q27h. Steam heating	0%	0.00	0.00	0	5%	2.00	2.00	1	2%	3.00	3.00	3
Q28. Once-through cooling	25%				50%				48%			
Q28a. Air conditioners	25%	1.60	1.00	5	***50%***	18.90	15.00	10	43%	8.02	3.00	91
Q28b. Air compressors	15%	1.33	1.00	3	14%	1.67	2.00	3	30%	3.25	2.00	61
Q29. Laundry	0%				14%				24%			
Q29a. Commercial washing machines	0%	0.00	0.00	0	5%	1.00	1.00	1	19%	2.26	2.00	42
Q29b. Self-service washing machines	0%	0.00	0.00	0	9%	1.50	1.50	2	11%	1.72	1.00	25
Q30. Kitchen facilities	65%	1.00	1.00	13	95%	1.62	1.00	21	81%	1.81	1.00	182
Q30a. Dishwashing machines	10%	1.00	1.00	2	68%	1.27	1.00	15	37%	1.78	1.00	83
Q30b. Kitchen faucets	65%	1.38	1.00	13	91%	3.20	2.50	20	77%	3.81	2.00	173
Q30c. Pre-rinse sprayers	10%				50%				27%			
Q30.c.1. High-flow pre-rinse sprayers	5%	1.00	1.00	1	28%	1.80	1.00	5	15%	2.45	1.00	31
Q30c.2. Low-flow pre-rinse sprayers	5%	1.00	1.00	1	6%	1.00	1.00	1	13%	1.66	1.00	27
Q30d. Food steamers	0%	0.00	0.00	0	9%	2.00	2.00	2	10%	1.23	1.00	22
Q30e. Garbage disposers	10%	1.00	1.00	2	50%	2.18	2.00	11	33%	3.03	1.00	74
Q30f. Water-cooled refrigeration	5%	0.00	0.00	0	14%	1.67	1.00	3	7%	2.86	1.50	14
Q31. Ice-making machines	35%				27%				39%			
Q31a. Water-cooled icemaking machines	5%	1.00	1.00	1	9%	1.00	1.00	2	4%	1.20	1.00	10
Q31b. Air-cooled icemaking machines	25%	2.80	2.00	5	18%	2.75	2.50	4	33%	2.89	2.00	73
Q32. Washing and sanitation	70%				86%				62%			
Q32a. General facility washdown and clean-up	45%				82%				36%			
Q32b. Sterilization equipment/autoclaves	5%	1.00	1.00	1	0%	0.00	0.00	0	10%	2.45	1.00	22
Q32c. Vehicle washes	10%	4.50	4.50	2	5%	1.00	1.00	1	3%	2.40	1.00	5
Q32d. Utility (general cleaning faucets)	50%	2.30	1.00	10	36%	3.00	2.50	6	41%	3.95	2.00	88
Q32e. Water-based sweeping equipment	25%	2.00	1.00	5	5%	1.00	1.00	1	11%	1.54	1.00	24

TABLE C-6 (Continued)
SPECIFIED WATER USES/APPLIANCES

	Wholesale grocery/related products facility				Elementary/secondary school				ALL SUBSECTORS			
Specified Water Uses/Appliances	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n	Percentage of Facilities with Use	Mean No. of Units	Median No. of Units	n
Number of surveys				**20**				**22**				**225**
Q33. Maintenance shops	10%	1.00	1.00	2	14%	1.00	1.00	3	19%	1.03	1.00	38
Q33a. Mainenance area faucets	5%	1.00	1.00	1	18%	3.00	3.50	4	9%	1.52	1.00	21
Q34. Laboratories	0%	0.00	0.00	0	18%	1.67	1.00	3	20%	1.60	1.00	40
Q34a. Laboratory faucets	0%	0.00	0.00	0	18%	11.33	6.00	3	16%	5.97	3.00	34
Q35. Process water for product manufacturing	45%				0%				28%			
Q35a. Process water as part of the product	20%				0%				9%			
Q35b. Water to convey product	5%				0%				1%			
Q35c. Product rinsing units	25%	2.40	2.00	5	0%	0.00	0.00	0	13%	7.96	2.00	28
Q35d. Milling, drillng, or cutting fluids	5%	1.00	1.00	1	0%	0.00	0.00	0	4%	4.00	2.00	10
Q35e. Chemical mixing	5%	1.00	1.00	1	0%	0.00	0.00	0	6%	5.50	1.00	11
Q35f. Manufacturing equipment cooling	10%	1.50	1.50	2	0%	0.00	0.00	0	12%	8.58	2.00	26
Q36. Process water purification equipment	20%	1.25	1.00	4	5%	0.00	0.00	0	43%	4.07	2.00	83
Q36a. Water softeners	10%	1.00	1.00	2	5%	1.00	1.00	1	24%	2.05	1.00	55
Q36b. Water filters	20%	1.00	1.00	4	0%	0.00	0.00	0	20%	2.41	1.00	46
Q36c. Reverse osmosis units	0%	0.00	0.00	0	0%	0.00	0.00	0	8%	2.00	1.00	16
Q36d. Deionization/ion exchange units	0%	0.00	0.00	0	0%	0.00	0.00	0	11%	3.08	2.00	24
Q36e. Sediment filtration	0%	0.00	0.00	0	0%	0.00	0.00	0	3%	2.14	1.00	7
Q36f. Activated carbon filtration	0%	0.00	0.00	0	0%	0.00	0.00	0	2%	14.00	10.00	5
Q36g. Ultra pure water used	5%				0%				2%			
Q37. Wastewater pretreatment equipment	10%	1.00	1.00	2	0%	0.00	0.00	0	9%	1.53	1.00	19
Q38. Miscellaneous water use	0%				0%				14%			
Q38a. Photographic/X-ray processing	0%	0.00	0.00	0	0%	0.00	0.00	0	8%	1.94	1.00	18
Q38b. Dialysis units	0%	0.00	0.00	0	0%	0.00	0.00	0	3%	10.67	2.00	6
Q38c. Liquid gas vaporizers	0%	0.00	0.00	0	0%	0.00	0.00	0	1%	3.00	3.00	2
Q38d. Fume/gas scrubbers	0%	0.00	0.00	0	0%	0.00	0.00	0	3%	3.43	2.00	7
Q38e. Liquid ring vacuum pumps	0%	0.00	0.00	0	0%	0.00	0.00	0	3%	3.43	3.00	7
Q39. Landscape uses	30%				95%				62%			
Q40. Water features	0%				36%				15%			
Q40a. Swimming pools	0%	0.00	0.00	0	23%	1.20	1.00	5	10%	1.09	1.00	22
Q40b. Jacuzzis/spas	0%	0.00	0.00	0	0%	0.00	0.00	0	8%	2.61	1.00	18
Q40c. Fountains	0%	0.00	0.00	0	9%	1.00	1.00	2	5%	1.73	1.00	11
Q41. Pressure regulators off the incoming line for indoor uses	5%	0.00	0.00	0	9%	0.00	0.00	0	13%	1.83	1.00	18
Q56. Water pressure at the highest available indoor fixture		64.29	65.00	17		65.92	63.00	12		65.73	65.00	124
Q42. Pressure regulators off the incoming line for outdoor uses	0%	0.00	0.00	0	36%	0.00	0.00	0	8%	1.67	1.00	6
Q43. Separate water meters for specific puposes of water use	0%				18%				18%			
Q44. Other indoor water-using equipment	25%				9%				21%			
	19 fish tanks car washes coffee maker				sinks in 17 classrooms							

TABLE C-7
CALCULATED END USE CHARACTERISTICS

General Site Inquiries	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	**26**	**28**	**22**	**21**	**5**	**22**	**22**	**22**	**15**	**20**	**22**	**225**
Square feet per employee (n)	23	26	19	21	4	20	8	21	11	17	7	177
Mean	530.6	706.5	618.0	1057.7	292.1	703.3	1947.0	565.7	378.4	1111.1	1432.8	792.6
Median	400.0	537.0	257.6	882.4	234.1	408.3	1728.8	545.5	250.0	833.3	1000.0	562.5
Number of toilets per employee (n)	23	28	21	21	5	22	22	22	15	20	20	219
Mean	0.28	0.21	0.21	0.30	0.25	0.20	4.28	0.10	0.60	0.24	0.38	0.67
Median	0.18	0.17	0.22	0.25	0.27	0.16	4.13	0.07	0.35	0.29	0.37	0.25
Number of employees per toilet (n)	23	28	21	21	5	22	22	22	15	20	20	219
Mean	6.98	8.53	6.36	4.84	4.39	8.01	0.32	16.53	3.11	7.18	4.04	6.73
Median	5.65	5.77	4.58	4.00	3.74	6.33	0.24	13.37	2.86	3.50	2.74	4.00
Number of showers per employee (n)	9	11	2	7	5	2	21	1	15	2	6	81
Mean	0.02	0.04	0.02	0.10	0.15	0.11	4.02	0.03	0.31	0.11	0.32	1.16
Median	0.02	0.03	0.02	0.08	0.12	0.11	3.78	0.03	0.08	0.11	0.34	2.07
Number of employees per shower (n)	9	11	2	7	5	2	21	1	15	2	6	81
Mean	89.17	49.25	212.50	13.43	11.57	26.25	0.35	30.00	17.87	14.00	4.65	28.83
Median	45.00	32.00	212.50	12.00	8.33	26.25	0.27	30.00	13.33	14.00	2.99	60.16
Number of urinals per employee (n)	23	26	7	15	3	12	16	16	1	13	19	151
Mean	0.08	0.07	0.09	0.12	0.01	0.05	0.06	0.03	0.01	0.09	0.19	0.09
Median	0.06	0.06	0.06	0.08	0.01	0.03	0.05	0.02	0.01	0.06	0.17	0.06
Number of employees per urinal (n)	23	26	7	15	3	12	16	16	1	13	19	151
Mean	26.59	29.50	68.79	15.44	102.78	44.46	21.67	44.15	115.00	18.34	7.11	29.64
Median	16.67	15.78	16.00	12.00	125.00	29.50	21.00	42.00	115.00	16.00	5.75	16.00
Number of faucets per employee (n)	24	28	22	21	5	22	22	22	15	20	22	223
Mean	0.34	0.32	0.60	0.45	0.31	0.51	4.36	0.17	0.69	0.34	0.39	0.80
Median	0.26	0.23	0.50	0.38	0.29	0.28	4.01	0.16	0.43	0.31	0.29	0.33
Number of employees per faucet (n)	24	28	22	21	5	22	22	22	15	20	22	223
Mean	6.24	7.65	4.72	4.00	3.57	4.58	0.60	8.63	2.72	4.88	9.53	5.47
Median	3.78	4.44	2.00	2.60	3.40	3.61	0.25	6.37	2.33	3.29	3.45	3.00
Number of dishwashers per employee (n)	11	6	4	2	5	6	19	0	13	2	15	83
Mean	0.05	0.01	0.09	0.04	0.01	0.06	0.05		0.03	0.01	0.03	0.04
Median	0.04	0.01	0.07	0.04	0.00	0.05	0.03		0.01	0.01	0.02	0.02
Number of employees per dishwasher (n)	11	6	4	2	5	6	19	0	13	2	15	83
Mean	30.85	198.69	14.50	28.00	547.40	69.83	51.29		111.26	85.00	72.44	102.16
Median	25.00	92.00	16.00	28.00	500.00	42.00	40.00		100.00	85.00	62.00	194.88
Number of clotheswashers per employee (n)	0	0	3	0	4	6	19	1	15	0	3	51
Mean			0.04		0.01	0.07	0.11	0.05	0.04		0.01	0.07
Median			0.02		0.01	0.04	0.09	0.05	0.03		0.01	0.03
Number of employees per clotheswasher (n)	0	0	3	0	4	6	19	1	15	0	3	51

TABLE C-7 (Continued)
CALCULATED END USE CHARACTERISTICS

General Site Inquiries	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Mean			48.33		215.58	43.08	29.89	20.00	46.06		83.50	54.81
Median			55.00		156.17	26.25	11.25	20.00	36.00		83.00	32.50
Number of drinking fountains per employee (n)	17	16	6	9	5	6	14	9	12	5	20	119
Mean	0.06	0.04	0.07	0.09	0.02	0.06	0.04	0.02	0.02	0.07	0.27	0.09
Median	0.04	0.03	0.06	0.04	0.02	0.03	0.03	0.01	0.02	0.06	0.11	0.03
Number of employees per drinking fountain (n)	17	16	6	9	5	6	14	9	12	5	20	119
Mean	31.54	64.05	18.36	40.28	62.03	35.11	42.80	46.77	62.28	23.60	13.93	39.65
Median	25.00	31.00	15.50	26.00	50.00	38.00	32.50	40.00	54.17	18.00	9.06	30.00
Number of restrooms per employee (n)	25	28	21	21	5	22	22	21	15	20	22	222
Mean	0.13	0.14	0.19	0.25	0.24	0.18	4.12	0.08	0.59	0.20	0.19	0.59
Median	0.04	0.10	0.20	0.20	0.26	0.13	4.10	0.06	0.35	0.22	0.17	0.16
Number of employees per restroom (n)	25	28	21	21	5	22	22	21	15	20	22	222
Mean	14.86	18.22	6.99	7.77	4.54	12.36	0.79	20.00	3.17	8.70	7.07	10.36
Median	10.00	9.83	5.00	5.00	3.85	7.50	0.24	17.67	2.86	4.58	5.79	6.12

TABLE C-8
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Number of toilets per site (Q26d) (n)	24	28	21	21	5	22	22	22	15	20	20	220
Mean	14.79	8.96	6.00	5.14	125.00	4.50	197.14	3.59	50.93	3.90	26.45	33.41
Median	10.00	7.00	3.00	2.00	70.00	3.00	157.00	3.50	35.00	3.00	23.50	8.00
Gravity Flush Toilets (Q45)												
Number of toilets tested	17	21	22	43	24	21	153	10	58	32	13	414
Mount												
Wall	0%	0%	0%	0%	0%	0%	1%	20%	7%	3%	8%	2%
Floor	100%	95%	100%	100%	100%	100%	99%	80%	93%	97%	92%	97%
Location												
Private	0%	33%	45%	30%	75%	38%	69%	70%	76%	41%	31%	56%
Common	100%	62%	55%	70%	25%	48%	31%	30%	24%	59%	69%	43%
Common Makes (frequency reported)												
"K"										1		1
"AS2"							1					1
"American Standard"	12	10	13	25	7	10	64	6	32	12	10	201
"Briggs"							17			1		18
"Crane"			2				18		1			21
"Eljer"	2			3		2			6	3		16
"Karat"										1		1
"Kilgore"			2				2					4
"Kohler"	3	7		7	10	3	42	2	7	6	1	88
"Lamosa"				2								2
"Mansfield"						1				1		2
"NI"						1						1
"Nivel Aqua"		1										1
"SA/SASA"									2	1		3
"Sloan"				2								2
"Titon"								1				1
"UPC/URC"				1			3					4
"Universal Rundle"									2	1		3
"Vitrionese"					5							5
"Vitromex/Virtromex Standard"						1	6			1		8
"Western Pottery ULF"									7			7
"Vestern ULF8"									1			1
"Don't know"		3	5	3	2	3		1		4	2	23
TOTAL	17	21	22	43	24	21	153	10	58	32	13	414
Distribution of toilet by age (if available, n)	9	7	10	20	19	11	49	3	24	17	4	173
1979 or before	44%	0%	0%	10%	0%	18%	3%	0%	4%	12%	50%	10%
1980 to 1989	0%	29%	60%	30%	11%	18%	5%	67%	42%	41%	25%	27%
1990 or later	56%	71%	40%	60%	89%	64%	24%	33%	54%	47%	25%	63%
Flush volume (n)	17	21	22	43	24	20	153	10	58	32	11	411
2gpf or less	35%	67%	14%	51%	58%	35%	67%	40%	45%	28%	27%	51%

TABLE C-8 (Continued)
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
>2 gpf to 4 gpf	47%	19%	55%	26%	8%	25%	13%	0%	17%	38%	73%	22%
>4 gpf	18%	14%	32%	23%	33%	40%	20%	60%	38%	34%	0%	27%
Flush volume (gpf)	17	21	22	43	24	20	153	10	58	32	11	411
Mean	3.24	2.36	3.45	2.84	2.78	3.65	2.49	4.11	3.21	3.58	2.89	2.91
Median	2.80	1.80	3.40	2.00	1.60	3.65	1.60	4.70	3.05	3.55	3.30	1.90
Percentage with displacement device	0%	0%	0%	2%	8%	5%	0%	0%	0%	3%	0%	1%
Percentage with infrared devices	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Percentage with notable leaks	0%	0%	0%	0%	0%	5%	0%	10%	0%	0%	0%	48%

TABLE C-8 (Continued)
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Pressure-assisted flush toilets (Q46)												
Number of toilets tested	23	14	4	4	0	6	3	8	3	6	22	93
Mount												
Wall	0%	14%	0%	0%		67%	100%	13%	0%	0%	36%	20%
Floor	100%	86%	100%	100%		17%	0%	88%	100%	100%	64%	79%
Location												
Private	0%	14%	25%	25%		50%	0%	63%	33%	17%	14%	18%
Common	100%	86%	75%	75%		50%	100%	38%	67%	83%	86%	82%
Common Makes (frequency reported)												
"American Standard"			1			1			2	1	11	16
"Crane"								1			1	2
"Eljer/PF2 Engergizer"		1		1								2
"Kohler"						2	3	2		3	10	20
"Mansfield"						1				1		2
"Sloan/Sloan Flushmate"	23	12	3	3		2		5		1		49
"Universal Rundle/Sloan Flushmate"		1							1			2
"Don't know"												0
TOTAL	23	14	4	4	0	6	3	8	3	6	22	93
Distribution of toilet by age (if available, n)	14	12	3	1		5	0	2	1	5	4	47
1979 or before	0%	0%	0%	0%		0%	0%	0%	0%	0%	0%	0%
1980 to 1989	0%	8%	0%	0%		20%	0%	0%	0%	60%	0%	11%
1990 or later	100%	92%	100%	100%		80%	0%	100%	100%	40%	100%	89%
Flush volume (n)	23	14	4	4		5	3	8	3	6	22	92
2gpf or less	91%	100%	100%	100%		60%	100%	100%	100%	50%	95%	91%
>2 gpf to 4 gpf	8%	0%	0%	0%		20%	0%	0%	0%	0%	0%	3%
>4 gpf	0%	0%	0%	0%		20%	0%	0%	0%	50%	5%	5%
Flush volume (gpf)	23	14	4	4		5	3	8	3	6	22	92
Mean	1.73	1.60	1.60	1.60		2.48	1.50	1.60	1.60	3.53	1.75	1.84
Median	1.60	1.60	1.60	1.60		1.60	1.50	1.60	1.60	3.50	1.60	1.60
Percentage with displacement device	9%	0%	75%	0%		0%	0%	0%	0%	0%	0%	5%
Percentage with infrared devices	0%	0%	0%	0%		17%	0%	0%	0%	0%	0%	1%
Percentage with notable leaks	0%	0%	0%	0%		0%	0%	0%	0%	0%	0%	0%

TABLE C-8 (Continued)
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Other types of toilets (Q47)												
Number of toilets tested	58	25	18	15	11	2	33	24	11	6	47	250
Mount												
Wall	66%	72%	39%	33%	91%	0%	61%	63%	45%	0%	36%	54%
Floor	34%	8%	61%	67%	9%	100%	39%	38%	55%	100%	62%	44%
Location												
Private	2%		17%	7%	55%	100%	42%	33%	82%	17%	13%	20%
Common	98%	76%	83%	93%	45%	0%	58%	67%	18%	83%	87%	78%
Common Makes (frequency reported)												
"American Standard"	5	8	3	1		2	10	3	5	1	8	46
"Crane"		1										1
"Eljer"							1					1
"Kohler"	3		3				3	3			1	13
"Naval Quiet Flush"		2										2
"Royal Sloan"	35			5			7	1	3		6	57
"Sloan"	11	14	8	9	11		8	17	3		32	113
"Toto self flush, American Standard"										5		5
"Zurn WSI XL LC AquaFlush"	4		4				4					12
TOTAL	58	25	18	15	11	2	33	24	11	6	47	250
Distribution of toilet by age (if available, n)	1	2	3	0	0	1	12	1	0	0	9	29
1979 or before	0%	0%	0%			100%	0%	0%			11%	7%
1980 to 1989	0%	0%	0%			0%	0%	0%			11%	3%
1990 or later	100%	100%	100%			0%	100%	100%			78%	90%
Flush volume (n)	48	23	18	15	3	1	33	24	11	6	46	228
2gpf or less	44%	61%	89%	33%	67%	0%	70%	75%	0%	100%	78%	62%
>2 gpf to 4 gpf	52%	22%	0%	67%	33%	0%	0%	25%	64%	0%	7%	25%
>4 gpf	4%	17%	11%	0%	0%	100%	30%	0%	36%	0%	15%	13%
Flush volume (gpf)	48	23	18	15	3	1	33	24	11	6	46	228
Mean	2.67	2.99	1.93	2.77	1.50	6.00	2.65	2.00	4.01	1.60	2.45	2.57
Median	3.20	1.60	1.60	3.20	1.60	6.00	1.60	1.60	3.50	1.60	1.60	1.60
Percentage with displacement device	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Percentage with infrared devices	2%	8%	0%	0%	0%	0%	30%	4%	0%	83%	11%	10%
Percentage with notable leaks	7%	4%	0%	7%	0%	0%	0%	13%	0%	0%	0%	4%

TABLE C-8 (Continued)
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
ALL types of toilets (Q45+Q46+Q47)												
Number of toilets tested	98	60	44	62	35	29	189	42	72	44	82	757
Mount												
Wall	39%	33%	16%	8%	29%	14%	13%	43%	13%	2%	32%	22%
Floor	61%	57%	84%	92%	71%	72%	87%	57%	88%	98%	67%	77%
Location												
Private	1%	15%	32%	24%	69%	43%	63%	48%	75%	34%	16%	39%
Common	99%	73%	68%	76%	31%	46%	37%	52%	25%	66%	84%	59%
Common Makes (frequency reported) (n)												
"K"										1		1
AS2							1					1
American Standard	18	18	17	26	7	13	74	9	39	14	29	264
Briggs							17			1		18
Crane		1	2				18	1	1		1	24
Eljer	2			3		2	1		6	3		17
Karat										1		1
Kilgore			2				2					4
Kohler	6	7	3	7	10	5	48	7	7	9	12	121
Lamosa				2								2
Mansfield						2				2		4
Naval Quiet Flush		2										2
NI						1						1
Nivel Aqua		1										1
PF/2 Energizer		1		1								2
SA/SASA									2	1		3
Sloan/Royal Sloan/Sloan Flushmate	68	27	11	19	11	2	15	23	6	1	38	221
Titon								1				1
Toto self flush, American Standard										5		5
Universal-Rundle									3	1		4
URC/UPC				1			3					4
Virionese					5							5
Vitromex						1	6			1		8
Western									1			1
Western Pottery									7			7
Zurn							4					4
Zurn WSI XL LC AquaFlush	4		4									8
Don't know		3	5	3	2	3		1		4	2	23
TOTAL	98	60	44	62	35	29	189	42	72	44	82	757
Distribution of toilet by age (if available, n)	24	21	16	21	19	17	61	6	25	22	17	249
1979 or before	17%	0%	0%	10%	0%	18%	8%	0%	4%	9%	18%	8%
1980 to 1989	0%	14%	38%	29%	11%	18%	13%	33%	40%	45%	12%	21%
1990 or later	83%	86%	62%	62%	89%	65%	79%	67%	56%	48%	71%	71%
Age of toilets (n)	24	21	16	21	19	17	61	6	25	22	17	249
Mean	1996	1999	1991	1992	1996	1990	1994	1991	1991	1990	1993	1993
Median	1999	2003	1990	1994	1995	1995	1998	1994	1990	1989	2002	1995

TABLE C-8 (Continued)
TOILET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Flush volume (n)	88	58	44	62	27	26	189	42	72	44	79	731
2gpf or less	55%	72%	52%	50%	59%	38%	68%	71%	40%	41%	76%	60%
>2 gpf to 4 gpf	40%	16%	27%	34%	11%	23%	11%	14%	24%	27%	14%	21%
>4 gpf	6%	12%	20%	16%	30%	38%	22%	14%	36%	32%	10%	20%
Flush volume (gpf) (n)	88	58	44	62	27	26	189	42	72	44	79	731
Mean	2.53	2.43	2.66	2.74	2.64	3.52	2.50	2.43	3.27	3.31	2.32	2.67
Median	1.60	1.60	1.60	2.09	1.60	3.13	1.60	1.60	3.50	3.25	1.60	1.60
Flush volume (mean) by age of toilet												
1979 or before	6.25	NA	NA	5.1	NA	6	5	NA	4	4.85	3.3	5.09
1980 to 1989	NA	2.53	3.67	4.02	2.8	3.13	1.6	5.7	5	5	1.6	3.83
1990 or later	1.7	1.62	2.26	2.27	2.6	2.02	2.48	1.6	1.96	2.37	1.91	2.15
Don't know	2.56	2.81	2.59	2.59	2.69	4.75	2.46	2.34	3.27	2.82	2.37	2.65
Flush volume (mean) by age of building structure												
1969 or before	1.6	1.6	2.5	3.22	3.9	3.24	1.6	2.54	3.21	3.74	2.31	2.63
1970 to 1979	2.89	1.62	2.65	2.4	1.71	3.62	3.2	2	4.33	2.63	2.44	2.65
1980 to 1989	2.58	3.2	3.3	3.14	NA	4.1	2.62	2.48	5	5.33	NA	3.05
1990 or later	1.83	1.8	2.22	1.6	5	NA	2.63	1.62	1.6	1.7	NA	2.31
Don't know	2.84	2.22	2.67	2.55	NA	4.8	2.02	2.78	3.2	3.25	1.6	2.58
Percentage with displacement device	2%	0%	7%	2%	6%	4%	0%	0%	0%	2%	0%	1%
Percentage with infrared devices	1%	3%	0%	0%	0%	4%	5%	2%	0%	11%	6%	3%
Percentage with notable leaks	4%	2%	0%	2%	0%	4%	0%	10%	0%	0%	0%	1%

TABLE C-9
URINAL DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with urinals (Q26e)	96%	93%	32%	71%	60%	55%	73%	73%	7%	65%	95%	69%
Number of urinals per site, if they exist (Q26e) (n)	24	26	7	15	3	12	16	16	1	13	19	152
Mean	4.50	3.04	3.14	2.20	9.67	2.17	4.44	1.94	1.00	1.77	14	4.53
Median	2.00	2.00	2.00	2.00	10.00	1.00	4.00	1.00	1.00	2.00	11.00	2.00
Percentage of sites with waterless urinals (Q26e.1.)	0%	0%	0%	0%	0%	0%	0%	5%	0%	0%	5%	1%
Number of waterless urinals per site, if they exist (Q26e.1) (n)	0	0	0	0	0	0	0	1	0	0	1	2
Mean								2.00			3.00	2.50
Median								2.00			3.00	2.50
Number of urinals tested (Q48)	36	25	6	18	4	9	18	17	1	16	47	197
Location												
Private	6%	4%	17%	22%	0%	33%	11%	35%	0%	31%	11%	15%
Common	94%	84%	83%	78%	100%	67%	89%	65%	100%	69%	89%	84%
Flush volume (n)	28	18	6	13	2	8	16	16	1	13	41	164
1 gpf or less	50%	78%	83%	85%	100%	63%	81%	75%	100%	62%	51%	66%
>1 gpf to 2 gpf	43%	6%	0%	15%	0%	13%	19%	13%	0%	8%	39%	23%
>2 gpf	7%	17%	17%	0%	0%	25%	0%	13%	0%	31%	10%	11%
Flush volume (gpf)	28	18	6	13	2	8	16	16	1	13	41	164
Mean	1.38	1.42	1.25	1.08	1.00	1.58	1.09	1.35	1.00	1.73	1.57	1.40
Median	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percentage with infrared devices	8%	24%	17%	0%	0%	0%	50%	0%	0%	19%	4%	12%
Percentage with notable leaks	0%	0%	0%	0%	0%	11%	0%	0%	0%	6%	0%	1%

TABLE C-10
FAUCET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with restroom faucets (Q26g)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Number of restroom faucets per site, if they exist (Q26g) (n)	24	28	21	21	5	22	21	22	15	20	18	217
Mean	14.00	8.04	6.86	4.71	125.20	3.77	200.33	3.05	49.80	3.35	24.78	32.47
Median	8.00	4.00	3.00	4.00	70.00	3.00	155.00	2.50	35.00	3.00	27.50	6.00
Percentage of sites with kitchen faucets (Q30b)	85%	71%	73%	52%	100%	68%	91%	77%	100%	65%	91%	77%
Number of kitchen faucets per site, if they exist (Q30b) (n)	22	20	16	11	5	15	19	17	15	13	20	173
Mean	3.36	1.90	1.44	1.27	5.40	3.40	9.05	4.00	7.33	1.38	3.20	3.81
Median	3.50	1.00	1.00	1.00	5.00	2.00	5.00	4.00	3.00	1.00	2.50	2.00
Percentage of sites with utility (general cleaning) faucets (Q32d)	23%	43%	45%	62%	60%	41%	23%	27%	73%	50%	36%	41%
Number of utility faucets per site, if they exist (Q32d) (n)	6	12	9	13	3	9	5	6	9	10	6	88
Mean	2.50	1.92	5.22	2.38	13.33	6.22	5.20	2.67	5.89	2.30	3.00	3.95
Median	1.50	2.00	2.00	1.00	10.00	4.00	4.00	1.00	3.00	1.00	2.50	2.00
Percentage of sites with maintenance area faucets (Q33a)	8%	11%	9%	0%	20%	14%	9%	5%	13%	5%	18%	9%
Number of maintenance area faucets per site, if they exist (Q33a) (n)	2	3	2	0	1	3	2	1	2	1	4	21
Mean	1.50	1.33	1.00	0.00	2.00	1.00	1.00	1.00	1.00	1.00	3.00	1.52
Median	1.50	1.00	1.00	0.00	2.00	1.00	1.00	1.00	1.00	1.00	3.50	1.00
Percentage of sites with laboratory faucets (Q34a)	4%	29%	55%	10%	60%	18%	0%	0%	7%	0%	18%	16%
Number of laboratory faucets per site, if they exist (Q34a) (n)	1	8	12	2	3	4	0	0	1	0	3	34
Mean	6.00	5.25	7.00	2.00	8.00	1.75	0	0.00	2.00	0.00	11.33	5.97
Median	6.00	2.50	3.50	2.00	10.00	1.50	0	0.00	2.00	0.00	6.00	3.00
Number of faucets tested (Q49)	97	68	70	84	36	38	185	57	73	45	79	832
Location												
Private	1%	15%	51%	21%	53%	37%	61%	33%	67%	31%	25%	38%
Common	99%	78%	46%	79%	47%	58%	39%	65%	33%	69%	75%	61%
Faucet type tested												
Kitchen	14%	19%	11%	13%	17%	24%	12%	30%	15%	20%	16%	16%
Bathroom	84%	74%	50%	70%	83%	68%	87%	65%	71%	76%	75%	75%
Utility	2%	3%	1%	13%	0%	3%	0%	4%	10%	4%	3%	4%
Other	0%	1%	36%	4%	0%	0%	1%	0%	4%		6%	5%

TABLE C-10 (Continued)
FAUCET DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Flow rate (n)	97	68	70	84	36	37	185	57	73	45	79	831
2 gpm or less	48%	34%	26%	29%	44%	41%	48%	32%	34%	38%	58%	41%
>2 gpm to 3 gpm	45%	60%	44%	48%	25%	35%	44%	37%	45%	40%	33%	43%
>3 gpm to 4 gpd	1%	3%	7%	7%	11%	14%	4%	12%	12%	11%	6%	7%
>4 gpm	5%	3%	23%	17%	19%	11%	4%	19%	8%	11%	3%	10%
Flow rate (n)	97	68	70	84	36	37	185	57	73	45	79	831
Mean	2.27	2.33	3.06	3.19	3.09	2.70	2.28	2.94	2.68	2.59	2.06	2.57
Median	2.10	2.25	2.50	2.50	2.25	2.30	2.10	2.50	2.40	2.50	2.00	2.25
Flush volume (mean) by age of building structure												
1969 or before	3.79	2.4	2.97	2.64	3.32	2.86	2.19	2.82	2.71	2.78	1.96	2.56
1970 to 1979	1.84	2.53	3.01	2.37	3.07	2.69	2.41	2.68	2.85	2.38	2.37	2.49
1980 to 1989	2.16	2.26	3.01	3.93	0	2.4	2.14	3.15	1.45	4.25	NA	2.62
1990 or later	2.11	2.13	3.5	2.27	1.65	NA	2.21	3.48	2.59	2.13	NA	2.51
Don't know	2.43	2.16	2.66	3.05	NA	1.75	2.84	2.64	3.23	1.93	2.45	2.68
Percentage with aerator attached	86%	78%	73%	77%	58%	61%	97%	65%	82%	69%	72%	79%
Percentage with infrared devices	2%	3%	0%	11%	0%	0%	3%	4%	3%	0%	6%	3%
Percentage with notable leaks	0%	3%	0%	1%	6%	0%	1%	4%	0%	0%	0%	1%

NA=not available

TABLE C-11
SHOWER DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with showers (Q26f)	38%	39%	9%	33%	100%	9%	100%	5%	100%	10%	27%	37%
Number of showers per site, if they exist (Q26f) (n)	9	11	2	7	5	2	21	1	15	2	6	81
Mean	1.44	2.36	1.50	1.00	55.80	1.50	193.24	2.00	22.53	1.00	40.83	61.43
Median	1.00	2.00	1.50	1.00	60.00	1.50	151.00	2.00	9.00	1.00	40.00	7.00
Number of showers tested (Q50)	6	5	1	11	21	0	118	0	35	0	6	203
Flow rate (n)	6	5	1	11	21		118		34		6	202
2 gpm or less	67%	40%	0%	73%	52%		5%		26%		33%	21%
>2 gpm to 3 gpm	17%	40%	100%	27%	33%		54%		47%		0%	47%
>3 gpm to 4 gpd	17%	0%	0%	0%	10%		37%		26%		67%	30%
>4 gpm	0%	20%	0%	0%	5%		3%		0%		0%	2%
Flow rate (n)	6	5	1	11	21		118		34		6	202
Mean	1.72	2.74	2.50	1.76	2.38		3.01		2.61		2.92	2.76
Median	1.35	2.50	2.50	1.83	2.00		3.00		2.80		3.20	2.80
Flush volume (mean) by age of building structure												
1969 or before	NA	NA	NA	NA	2.64		2.85		2.63		3.38	2.80
1970 to 1979	NA	NA	NA	NA	1.75		2.89		2.80		2.00	2.39
1980 to 1989	NA	2.74	NA	1.76	NA		3.06		3.07		NA	2.58
1990 or later	1.98	NA	2.50	NA	4.67		2.95		2.42		NA	2.88
Don't know	1.20	NA	NA	NA	NA		3.41		2.00		NA	3.16
Shower type tested												
Atomizing	100%	40%	0%	0%	5%		45%		71%		0%	43%
Stream/spray	0%	40%	100%	100%	95%		49%		26%		33%	51%
Shower type tested												
Fixed	17%	60%	0%	91%	71%		86%		26%		100%	72%
Handheld	83%	20%	100%	9%	29%		14%		74%		0%	27%
Percentage with showerhead shut-off button	17%	0%	0%	0%	14%		40%		26%		0%	30%
Percentage with notable leaks	0%	0%	0%	0%	0%		9%		0%		0%	5%

TABLE C-12
DISHWASHER DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with dishwashers (Q30a)	42%	21%	18%	10%	100%	27%	86%	0%	87%	10%	68%	37%
Number of dishwashers per site, if they exist (Q30a) (n)	11	6	4	2	5	6	19	0	13	2	15.00	83
Mean	2.55	1.83	1.00	1.50	1.00	1.00	1.68	0.00	2.92	1.00	1.27	1.78
Median	1.00	1.50	1.00	1.50	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Number of dishwashers tested (Q51)	9	8	4	2	5	5	21	0	10	1	12	77
Percentage that are Energy Star	0%	13%	0%	0%	0%	60%	14%		40%	100%	0%	16%
Makes/Model #'s (frequency reported)												
ASKO/D1716 **											**1**	1
American Dish Service/120						1						1
Auto Chlor/ADC-1/ADC-44							1					1
Autochlor/Space Saver/DK		1				1						2
BOSCH DLX	1											1
Bosch/S5E56B		3										3
CAN/Energy Mizer/A-2									1			1
Champion Industries/Ecolab ES4000/64KB							1					1
DK/GHD3525F00BB							1					1
Ecolab ES 2000						1						1
Ecolab Stero/SC-20-1AM							2					2
Ecolab/DK							1					1
Ecolab/ES400									2			2
Ecolab/ES4000							1		1			2
Ecostar/ES400									1			1
GE PERMATUR/GSM2100G02WW **	1											1
GE Park							2					2
GE Potscrubber 1420											1	1
GE Potscrubber 1420/GSD1420T55BB											1	1
GE Potscrubber 640	1											1
GE Potscrubber 720			1									1
GE, Potscrubber/DK			1									1
GIBSON				1								1
HOBART/AH-14						1						1
Hobart/DK							2		1			3
Hobart/C44							1				1	2
Hobart/CRS-66							1					1
Hobart/LT 1									1			1
Hobart/LX18							1					1
Hobart/LX30							1					1
Hotpoint/DK	1											1
Hotpoint/HDA100X-66WH	1											1
Jackson Faspray Automatic Dishwasher/10APR											1	1
Jackson JFX-300							1					1
Jackson/DK					1							1
Kenmore/587144490			1									1
Kenmore/DK		1										1
Kenmore/Ultra Wash III/1765991											1	1
Kinght/KLE235d					1							1
Kirkland/SUD7000MS0 **						1						1
Kitchen Aid - Whisper Quiet Ultima/KUDV24SEWH1 F	1											1
Kitchenaid/KUD123OBO		1										1
KitchenaidDK		1										1
Maytag/DK		1										1
Maytag/Jetclean	1											1
Maytag/MDB5600AWB **	1											1
Mielo G892 Touchtronic Turbothermic/00/54097064 **											1	1

TABLE C-12 (Continued)
DISHWASHER DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
S.E. Rykoff/JS-1											1	1
SciCan/Hydrim L110W/71217103			1									1
Stereo/Dk				1	2		1				3	7
Stereo/SC202A							1					1
Stereo/dwr01							1					1
Stero Ecotemp/SC-20-1AM											1	1
Stero/ETS							1					1
Stero/SCT-44					1				1			2
Stero/SDRA									1			1
Stero/sct-7Gsc-csa							1					1
Westinghouse/DK									1			1
Whirlpool/DV927QWDQ1	1											1
Whirlpool/DU800CWDB5										1		1
TOTAL	9	8	4	2	5	5	21	0	10	1	12	77
Dishwasher type												
Stationary rack	100%	100%	100%	0%	40%	80%	62%		70%	100%	75%	74%
Conveyor type	0%	0%	0%	50%	60%	0%	33%		30%	0%	25%	22%
Other	0%	0%	0%	0%	0%	20%	0%		0%	0%	0%	1%
Don't know	0%	0%	0%	50%	0%	0%	5%		0%	0%	0%	3%
Rinse type												
Water	100%	88%	100%	50%	40%	40%	19%		40%	100%	75%	56%
Chemical	0%	13%	0%	50%	60%	60%	76%		60%	0%	17%	42%
Don't know	0%	0%	0%	0%	0%	0%	5%		0%	0%	8%	3%
Percentage with incoming pressure regulator	0%	13%	25%	50%	60%	0%	33%		60%	0%	0%	25%

Note: BOLD make/model numbers are listed as an Energy Star-Qualified dishwasher

TABLE C-13
CLOTHESWASHER DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with laundry facilities (Q29)	0%	0%	18%	5%	80%	27%	86%	5%	100%	0%	14%	24%
Percentage of sites with commercial washing machines (Q29a)	0%	0%	14%	DK	40%	14%	82%	0%	100%	0%	5%	19%
Number of commercial clotheswashers per site, if they exist (Q29a) (n)	0	0	3	DK	2	3	18	0	15	0	1	42
Mean			1.00		2.50	1.33	2.33		2.67		1.00	2.26
Median			1.00		2.50	1.00	2.00		2.00		1.00	2.00
Percentage of sites with self-service clotheswashing (Q29b)	0%	0%	0%	DK	40%	14%	59%	5%	27%	0%	9%	11%
Number of self-service clotheswashers per site, if they exist (Q29b) (n)	0	0	0	0	2	3	13	1	4	0	2	25
Mean					1.00	1.00	1.85	1.00	2.50		1.50	1.72
Median					1.00	1.00	2.00	1.00	1.00		1.50	1.00
Number of clotheswashers tested (Q52)	0	0	1	2	6	4	41	0	29	0	2	85
Makes/Model #'s (frequency reported)												
30022M5J							1					1
30022T5X							1					1
Ecolab Uniwash/UW60PVQU10002									1			1
Ecolab Uniwash/UW85PN4									1			1
Galaxy/DK						1						1
GE Sensor Wash/DK									1			1
Hotpoint/DK									1			1
Kenmore/110.22422100											1	1
Kenmore/22292100					1							1
Maytag /DK							5		2			7
Maytag performer/LAT2500AAE			1									1
Maytag/Commercial Washer/MAT12PDBAW							1					1
Maytag/Heavy Duty Auto Dry Control/MAT12CSAAW									1			1
Maytag/MAH14PDAAW **							1					1
Maytag/MFX50PNAVS									1			1
Maytag/Performa/DK							1					1
Milnor/DK							3		1			4
Milnor E-P Express/30022T5X									2			2
Milnor E-P Plus/30022V6J					1							1
Milnor E-P Plus/DK				2	1		2		1			6
Milnor EPT/DK						1						1
Milnor System 7 36026Q6G							1					1
Milnor System 7/3020M5G									2			2
Milnor/3001504M/AAS									1			1
Milnor/30015M4J							1					1
Milnor/30020C5m							1					1
Milnor/30022F8J							1					1
Milnor/30022M5J					2		4					6
Milnor/30022V6J					1							1
Milnor/E-Plus/30022M5J							2					2
Milnor/EP-Plus/36026Q6J									1			1
Milnor/System 7/36026Q6G							1					1
Milnor/System 7/36026Q6J							1					1
Milnor/System 7/42026V6J							2					2
Sears/417.93802200											1	1
Speed Queen/DK							1					1
Speed Queen/SC35MN2LU10001						1						1
Taylor Uniwash/UW85PN4									1			1
UniMac (Raytheon)/UW60S30U10001									1			1
UniMac (Raytheon)/UW60S30U10002									1			1
UniMac/DK							2		1			3

TABLE C-13 (Continued)
CLOTHESWASHER DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
UniMac/UW35PVQU2									1			1
UniMac/UW50PN3									1			1
UniMac/UW50PVQU30001									2			2
UniMac/UW60PVQU10001									1			1
UniMac/UW60PVQU1001									1			1
UniMac/UW60PVQU50001							1					1
UniMac/UW65PN4							1					1
UniWash/DK									1			1
Wascomat/W640							1					1
Wascomat/W655							1					1
Whirlpool/Heavy Duty Commercial Washer/CA2000XMWD									1			1
Whirlpool/Heavy Duty Super Capacity/LSR8133HQ0						1						1
Whirlpool/ca2751xyw0							2					2
Don't know							3		1			4
TOTAL	0	0	1	2	6	4	41	0	29	0	2	85
Washer type												
Top-loading			100%	0%	17%	75%	22%	100%	14%		100%	24%
Front-loading			0%	100%	83%	25%	76%	0%	86%		0%	75%
Don't know			0%	0%	0%	0%	2%	0%	0%		0%	1%
Capacity in pounds of materials (n)			0	2	6	3	21	0	19		0	51
Mean			DK	35.0	43.3	35.0	63.1	DK	58.0		DK	56.1
Median			DK	35.0	35.0	27.5	67.5	DK	57.5		DK	55.0
Number of cycles (n)			1	2	2	3	18	0	19		0	45
Mean			13.0	4.0	4.0	4.7	5.7	DK	4.4		DK	5.1
Median			13.0	4.0	3.5	6.0	4.0	DK	4.0		DK	4.0
Percentage with water saving/load size selection feature			100%	0%	17%	75%	27%	100%	52%		100%	39%

Note: BOLD make/model numbers are listed a Consortium for Energy Efficency Qualifying Product for the Clotheswasher Initiative

TABLE C-14
GARBAGE DISPOSAL DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with garbage disposers (Q30e)	58%	36%	18%	10%	80%	14%	45%	5%	87%	10%	50%	33%
Number of garbage disposers per site, if they exist (Q30e) (n)	14	10	4	2	4	3	10	1	13	2	11	74
Mean	4.07	1.80	2.25	1.00	1.50	1.67	2.10	1.00	6.08	1.00	2.18	3.03
Median	4.00	1.00	1.00	1.00	1.50	2.00	1.50	1.00	1.00	1.00	2.00	1.00
Number of garbage disposers tested (Q53)	13	11	3	1	2	2	6	0	12	2	9	61
Common Makes (frequency reported)												
"GE Disposall"											2	2
"In Sink Erator"	6	2	2	1	2	1	3		7	1	3	28
"In Sink Erator/Badger"	4	3	1									8
"Salvajor"									2		1	3
"Badger"		4										4
"Bonecrusher-sinkmer"						1						1
"Sinkmaster"	3								1		1	5
"Waste King"		1								1	1	3
"Don't know"		1					3		2		1	7
TOTAL	13	11	3	1	2	2	6	0	12	2	9	61
Disposer type												
Disposer	100%	91%	100%	100%	100%	100%	83%		75%	100%	100%	92%
Scapper/disposer	0%	0%	0%	0%	0%	0%	0%		25%	0%	0%	5%
Conveyor/disposer	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%
Don't know	0	9%	0%	0%	0%	0%	17%		0%	0%	0%	3%

TABLE C-15
SWIMMING POOL DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with swimming pools (Q40a)	0%	0%	0%	0%	0%	0%	77%	0%	0%	0%	23%	10%
Number of swimming pools per site, if they exist (Q40a) (n)	0	0	0	0	0	0	17	0	0	0	5	22
Mean							1.06				1.20	1.09
Median							1.00				1.00	1.00
Number of indoor swimming pools tested (Q54)	0	0	0	0	0	0	2	0	0	0	0	2
Percentage with notable leaks							0%					0%
Length of swimming pool (ft.) (n)							2					2
Mean							27.5					27.5
Median							27.5					27.5
Width of swimming pool (ft.) (n)							2					2
Mean							22.5					22.5
Median							22.5					22.5
Average depth of swimming pool (ft.) (n)							2					2
Mean							4.3					4.3
Median							4.3					4.3
Percentage with pool cover							0%					0%
Number of outdoor swimming pools tested (Q12-Outdoor)	0	0	0	0	0	0	13	0	0	0	3	16
Percentage with notable leaks							0%				0%	0%
Length of swimming pool (ft.) (n)							12				2	14
Mean							31.6				24.0	30.5
Median							31.5				24.0	31.5
Width of swimming pool (ft.) (n)							12				2	14
Mean							21.2				43.0	24.3
Median							19.5				43.0	19.5
Average depth of swimming pool (ft.) (n)							13				3	16
Mean							5.0				6.3	5.2
Median							5.0				6.0	5.0
Percentage with pool cover							0%				100%	19%

TABLE C-16
SPAS/JACUZZI DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with jacuzzis/spas (Q40b)	0%	0%	0%	0%	20%	0%	73%	0%	7%	0%	0%	8%
Number of jacuzzis/spas per site, if they exist (Q40b) (n)	0	0	0	0	1	0	16	0	1	0		18
Mean					1.00		2.81		1.00			2.61
Median					1.00		1.00		1.00			1.00
Number of indoor spas/jacuzzis tested (Q55)	0	0	0	0	0	0	3	0	1	0	0	4
Percentage with notable leaks							0%		0%			0%
Length of spa (ft.) (n)							3		1			4
Mean							6.7		5.0			6.3
Median							7.0		5.0			6.5
Width of spa (ft.) (n)							3		1			4
Mean							7.0		3.0			6.0
Median							6.0		3.0			5.0
Average depth of spa (ft.) (n)							3		1			4
Mean							2.8		2.0			2.6
Median							2.5		2.0			2.5
Percentage with spa cover							0%		0%			0%
Number of outdoor spas/jacuzzis tested (Q13-Outdoor)	0	0	0	0	0	0	13	0	0	0	0	13
Percentage with notable leaks							0%					0%
Length of spa (ft.) (n)							11					11
Mean							10.6					10.6
Median							10.0					10.0
Width of spa (ft.) (n)							11					11
Mean							9.8					9.8
Median							10.0					10.0
Average depth of spa (ft.) (n)							11					11
Mean							3.1					3.1
Median							3.0					3.0
Percentage with spa cover							13%					13%

TABLE C-17
FOUNTAIN/POND DATA

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of surveys	26	28	22	21	5	22	22	22	15	20	22	225
Percentage of sites with fountains (Q40c)	8%	0%	0%	0%	20%	0%	18%	0%	13%	0%	9%	5%
Number of fountains per site, if they exist (Q40c) (n)	2	0	0	0	1	0	4	0	2	0	2	11
Mean	2.00				1.00		2.50		1.00		1.00	1.73
Median	2.00				1.00		1.50		1.00		1.00	1.00
Number of fountains/ponds tested (Q14-outdoor)	4	0	0	0	0	0	10	0	2	0	0	16
Percentage with notable leaks	0%						0%		50%			6%
Length of feature (ft.) (n)	4						1		2			7
Mean	32.8						10.0		5.4			21.7
Median	30.3						10.0		5.4			9.0
Width of features (ft.) (n)	4						1		2			7
Mean	13.8						10.0		5.4			10.8
Median	12.8						10.0		5.4			9.0
Average depth of feature (ft.) (n)	4								2			6
Mean	1.3						DK		0.9			1.2
Median	1.4						DK		0.9			1.3
Percentage with recirculating system	100%						90%		100%			94%

TABLE C-18
OUTDOOR CHARACTERISTICS

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of sites surveyed (not all sites participated in outdoor survey)	26	28	22	21	5	22	22	22	15	20	22	225
Number of valid responses *	11	10	7	9	4	2	19	7	14	6	19	108
Lot size of this location (sq. feet) (Q3-outdoor) (n)	11	10	7	8	0	2	15	7	11	6	17	94
Mean	98,272	98,454	73,105	61,053		34,088	155,684	41,096	97,684	56,726	313,665	133,021
Median	65,400	72,750	41,400	46,729		34,088	102,700	45,100	75,776	50,000	250,000	86,771
Sq. footage of hardscape (Q4-outdoor) (n)	11	9	7	9	0	2	15	6	11	6	16	92
Mean	82,041	72,860	65,006	50,976		34,088	112,495	38,879	83,532	54,446	229,882	102,006
Median	64,000	42,500	38,393	37,388		34,088	100,000	43,550	73,266	46,500	208,245	100,000
Sq. footage of landscapable areas (Q5-outdoor) (n)	11	9	7	9	0	2	15	7	11	6	16	93
Mean	16,230	10,639	8,101	4,082		0	9,289	228	12,988	2,280	94,407	23,395
Median	8,396	4,000	5,225	1,620		0	6,000	0	4,700	640	61,075	6000.00
Percentage of landscape area/total lot area (Q5/Q3) (n)	11	9	7	8		2	14	7	11	6	16	91
Mean	16%	13%	15%	8%		0%	8%	1%	10%	3%	26%	12%
Median	13%	11%	9%	6%		0%	6%	0%	6%	3%	25%	9%
Min	2%	2%	3%	0%		0%	3%	0%	1%	0%	7%	0%
Max	53%	35%	39%	24%		0%	19%	2%	27%	10%	62%	65%
Sq. footage of landscapable areas that is irrigated (Q6-outdoor) (n)	7	8	5	9	0	2	15	7	9	5	11	78
Mean	12,436	11,824	3,739	2,018		0	9,069	229	5,783	1,356	54,399	12,992
Median	7,000	5,822	3,000	896		0	4,500	0	3,045	280	45,000	3,023
Percentage of irrgated landscape/total lot area (Q6/Q3) (calculated) (n)	7	8	5	7		2	14	7	9	5	11	75
Mean	16%	13%	13%	7%		0%	8%	1%	7%	3%	18%	10%
Median	13%	11%	9%	4%		0%	6%	0%	5%	3%	18%	6%
Min	2%	2%	3%	0%		0%	2%	0%	1%	0%	1%	0%
Max	53%	35%	29%	24%		0%	19%	2%	18%	9%	32%	53%
Sq. footage of turf (lawn) area (Q7-outdoor) (n)	5	9	5	8	0	2	16	7	11	5	11	79
Mean	8,115	2,621	1,419	2,363		0	4,915	43	5,219	320	47,672	9,525.4
Median	2,386	2,100	500	1,140		0	1,000	0	2,000	0	35,000	1,000.0
Percentage of turf area/landscapable area (Q7/Q5) (calculated) (n)	5	9	5	6	0	0	15	2	11	3	11	67
Mean	82%	39%	33%	59%			22%	15%	38%	14%	64%	42%
Median	86%	21%	17%	78%			22%	15%	37%	20%	79%	28%
Min	66%	0%	0%	0%			0%	0%	0%	0%	0%	0%
Max	100%	100%	100%	100%			56%	30%	91%	23%	100%	100%
Percentage of turf area/irrigated landscapable area (Q7/Q6) (calculated) (n)	5	8	4	5	0	0	15	2	9	3	9	60
Mean	82%	44%	42%	71%			23%	15%	39%	15%	97%	49%
Median	86%	36%	33%	100%			22%	15%	16%	20%	85%	30%
Min	66%	0%	0%	0%			0%	0%	0%	0%	0%	0%
Max	100%	100%	100%	100%			56%	30%	91%	25%	100%	100%
Types of irrigation systems (n) (Q9-outdoor)	9	5	4	2	4	2	19	2	14	3	19	83
[multiple types reported, will not add to 100%]												
Automatic in-ground	89%	100%	75%	100%	100%	100	89%	100%	79%	33%	95%	88%
Manual in-ground	25%	0%	0%	0%	50%	0	39%	0%	25%	33%	11%	23%
Automatic drip	38%	25%	0%	0%	25%	0	83%	50%	42%	33%	47%	48%
Manual drip	0%	0%	0%	0%	50%	0	33%	0%	0%	0%	10%	13%
Hose only	22%	0%	0%	0%	0%	0	0%	0%	25%	0%	5%	8%
Hose & sprinkler	0%	0%	0%	0%	0%	0	22%	0%	8%	0%	0%	6%
Hose & sprinkler, with timer	10%	0%	33%	0%	25%	0	11%	0%	0%	0%	10%	9%

* Note: Some portion of the outdoor survey completed; "n" sizes per variable specifies the number of valid responses

TABLE C-19
AUTOMATIC IRRIGATION SYSTEM CHARACTERISTICS

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of sites surveyed (not all sites participated in outdoor survey)	26	28	22	21	5	22	22	22	15	20	22	225
Number of irrigation system controllers (Q10-Outdoor) (n)	7	1	1	1	2	1	16	1	11	3	15	59
Mean	1.0	1.0	2.0	1.0	4.5	2.0	2.7	1.0	1.7	1.0	2.9	2.2
Median	1.0	1.0	2.0	1.0	4.5	2.0	2.0	1.0	1.0	1.0	2.0	2.0
Number of times controllers are adjusted annually (Q10a-Outdoor) (n)	4	1	1	1	1	1	15	1	10	1	12	48
Mean	3.1	3.0	2.0	2.5	4.0	2.5	2.5	0.0	2.6	1.0	7.2	3.7
Median	3.0	3.0	2.0	2.5	4.0	2.5	3.0	0.0	2.0	1.0	6.0	3.0
Number of controllers tested (Q11-Outdoor)	5	1	2	1	3	3	29	1	11	2	11	69
Common Makes (frequency reported)												
"Champion"									1			1
"Hardee"	1											1
"Haride HR 6200"							1					1
"Irritrol"	2				3	1	9	1	2	2	3	23
"Lawn Genie"						2	1					3
"MC-24"							2					2
"Rainbird"			2				11		5		6	24
"Raindial"									1			1
"Rainmaster"							4		2			6
"Sterling"	1											1
"Toro"		1		1								2
"Watermaster"							1				2	3
"Don't know"	1											1
TOTAL	5	1	2	1	3	3	29	1	11	2	11	69
Type of controller (n)	4	1	2	1	3	3	29	1	11	2	11	69
Mechanical	0%	0%	100%	0%	0%	67%	7%	100%	0%	50%	0%	12%
Digital	100%	100%	0%	100%	100%	0%	76%	0%	73%	50%	100%	81%
Unknown	0%	0%	0%	0%	0%	33%	17%	0%	27%	0%	0%	7%
Number of stations (n)	3	1	0	1	3	3	14	0	6	1	9	41
Mean	8.33	7.00		15.00	36.00	10.33	15.07		3.50	13.00	9.89	12.68
Median	12.00	7.00		15.00	36.00	6.00	10.00		2.00	13.00	6.00	8.00
Number of zones (n)	1	1	0	0	3	1	9	0	7	1	8	31
Mean	30.00	3.00			12.00	5.00	9.00		3.57	3.00	8.63	8.13
Median	30.00	3.00			12.00	5.00	12.00		3.00	3.00	3.00	4.00
Sprinkler types (n) [multiple types reported, will not add to 100%]	5	1	2	1	3	3	29	1	11	2	11	69
Pop-up	80%	100%	0%	100%	100%	67%	86%	0%	91%	50%	100%	84%
Rotor	40%	0%	0%	0%	100%	0%	17%	0%	0%	0%	27%	19%
Impact	0%	0%	0%	0%	0%	67%	0%	0%	0%	0%	18%	7%
Bubbler	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	9%	6%
Drip	60%	0%	0%	0%	100%	0%	83%	100%	9%	50%	36%	54%
Microspray	0%	0%	100%	0%	0%	0%	21%	100%	0%	50%	0%	15%
Hose	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hose/sprinkler	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Don't know	20%	0%	0%	0%	0%	33%	3%	0%	9%	0%	0%	6%

TABLE C-19 (Continued)
AUTOMATIC IRRIGATION SYSTEM CHARACTERISTICS

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Percentage of systems with programmable multiple start time capabilities (n)	5	1	2	1	3	3	29	1	11	2	11	69
	80%	100%	100%	100%	100%	0%	90%	0%	73%	50%	91%	81%
Type of calendar clock (n)	4	1	2	1	3	3	29	1	11	2	11	69
7-day	100%	0%	100%	0%	100%	67%	38%	100%	45%	100%	36%	49%
14-day	0%	100%	0%	0%	0%	0%	0%	0%	9%	0%	18%	6%
30-day	0%	0%	0%	0%	0%	0%	24%	0%	0%	0%	9%	12%
Other	0%	0%	0%	0%	0%	0%	0%	0%	9%	0%	9%	4%
Don't know	0%	0%	0%	100%	0%	33%	38%	0%	36%	10%	27%	29%
Percentage of systems with moisture/rain sensor	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	9%	3%
Percentage of systems with ET settings	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%

* Note: Some portion of the outdoor survey completed; "n" sizes per variable specifies the number of valid responses

TABLE C-20
CATCH-CAN TESTS

Data Parameters	Office buildings	Semicond./ electronic comp. manuf.	Office of physician or dentist	Fab. metal product manuf.	Hospital	Food product manuf.	Hotel/motel	Grocery store	Nursing care facilities	Wholesale grocery/related products	Elementary/ secondary school	ALL SUBSECTORS
Number of sites catch-can tests performed	2	1	1	0	1	0	11	1	9	2	6	34
Catch-can tests (Q15-Outdoor)												
Number of cans used	23	15	5		11		93	5	96	18	60	326
Sprinkler types [multiple types reported, will not add to 100%]												
Microspray	0%	0%	100%		0%		4%	100%	0%	44%	0%	7%
Popup	100%	100%	0%		55%		91%	0%	95%	56%	100%	89%
Rotor	0%	0%	0%		36%		4%	0%	21%	0%	0%	9%
Run-time (minutes)	13.26	18.00	10.00		10.00		10.48	10.00	13.02	10.00	11.70	11.94
Can-height (cm)	1.13	1.29	1.90		0.48		1.96	0.34	0.78	1.36	0.76	1.19